ENGINEERING NEWS-RECORD

FEBRUARY 11, 1943

Annual Review and Forecast

INCLUDING . . .

Construction Overseas

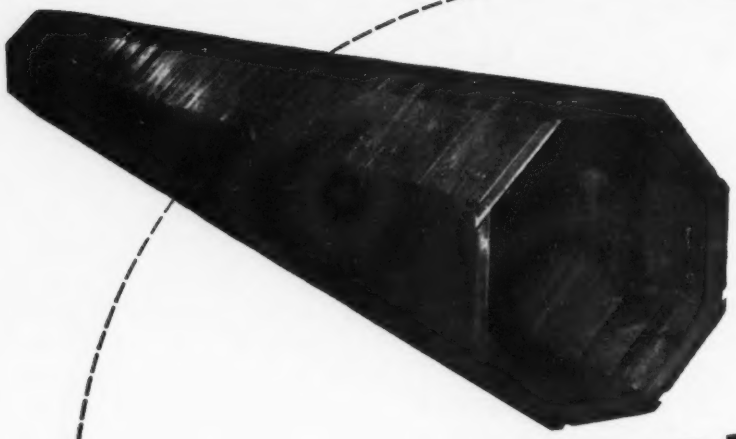
★ ★

Army Engineer Work Abroad

Sanitation in Latin America

Navy Construction in Theatres of Operation

Airport Construction in Africa



WOOD PIPE CARRIES ON

while steel saves lives

More and better equipment on the fighting front means a shorter war and fewer American lives lost. You can help by saving vital metal wherever possible.

One way is to substitute ARMCO Emergency Wood Pipe for drainage structures made of critical materials. This sturdy pipe requires no steel sheets and bands, wire mesh or metal reinforcing. It is easy to handle, saves on transportation and has ample strength to meet engineering standards. When the emergency is over, a corrugated metal pipe may easily be threaded through or jacked around the wood structure.

ARMCO Corrugated Metal Pipe is only on temporary "leave of absence." It will be back after the war with its flexible strength, long lengths, tight joints, and low installation costs.

Meanwhile, steel must not be used in any drainage structure unless engineering integrity demands it. Remember it's not just pounds of metal you are saving—it represents ships, trucks and tanks delivered to our fighting fronts. As desirable as ARMCO Ingot Iron culverts are, you'll find ARMCO Emergency Pipe a practical substitute. Write for data. Armco Drainage Products Assn., 135 Curtis St., Middletown, O.

ARMCO ARMCO **EMERGENCY PIPE**

ENGINEERING NEWS-RECORD

oted to Buildings, Sewers, Waterworks, Bridges, Roads, Dams, Foundations, Earthwork, Flood Control, Public Works, Shipbuilding, Irrigation, Canals, Railroads

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ol. 130 FEBRUARY 11, 1943 No. 6

COMING NEXT

An outstanding design for indus-ial plants devoted to the manufac-re of precision instruments for war e will be described in the Feb. 25 sue. Of special interest is the use glass block directional lighting nits to achieve a high degree of atural daylight illumination, and air-conditioning system insuring igid control over temperature and oisture content.

• Evaluation of Soils for Specific oad Uses—A timely article cover-ng an important method developed ecently for proper selection and lacement of soils as a means of in-reasing the life and decreasing the ost of maintaining highway sur-aces. Charts used in the procedure nd how they can be effectively em-loyed is outlined.

• An unusually efficient design for eaplane ramps will be described. The design involves the use of pre-ast concrete beams and slabs that an quickly be installed on previ-usly driven piles, without recourse to the costly and time-consuming perations incident to constructing amps inside pumped-out cofferdams. Design and construction features are overed.

• The problem of laying a 30-in. dia. ast iron water main in a deep river channel was solved by the use of a pecially designed, curved, launch-ng cradle. How the work was carried ut will appear in ENR for Feb. 25.

LOOKING AHEAD

• The most intricate problem in ac-cess road design and planning, im-posed upon engineers for at least a decade, was brought about by con-struction of the War Department's new office building at Arlington, Va. In reality, the road system is an integral part of the building design. Some 40,000 employees are moved into and out of the area daily over a network that is free of stop-and-go lights, stop signs, left turns, grade intersections, and direct access from private property. Terminal facilities are provided for parking 8,000 cars, and for off-street bus, taxi and truck service. This major network will be described in an early issue.

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Number of copies of this issue printed: 36,143

The new plant of the Metal Moulding Corporation in Detroit, Michigan, is producing vital war materials. Ryerson Reinforcing Steel was used in Monitor Type Rigid-Frame building by the Cooper Construction Company, contracting engineers.

The Answer . . . Rigid-Frame Construction

For new plant buildings or additions to present facilities, use reinforced concrete *Rigid-Frame Construction*, assuring maximum economy. This ingenious refinement of conventional design results in better structural balance, more strength and safety. It saves critical, wartime steel—and reduces maintenance costs and insurance rates.

Our special department for Contractors & Builders includes a complete reinforcing steel-service. Every step, from estimates to final delivery is coordinated with your needs. Experienced crews handle the cutting and forming of steels to your exact specifications. Deliveries are scheduled with the progress of the job. And each load is tagged for quick assembly which expedites the construction work. A complete structural shop also handles structural and plate fabrication.

Every type of construction and manufacturing steel is in stock . . . including structurals, bars, plates, sheets, etc. Ryerson Steel-Service may save you time and money—so let us help you with your construction problems.

Ryerson Building Products

New billet or re-rolled rail deformed reinforcing rounds and squares conforming to Schedule I of Limitations Order L-211. Steel Spirals complete with channel spacers. Wire Mesh in rolls or sheets for building or road work. Removable forms for concrete joist construction. Expansion and contraction joints, center strip, etc., for road work. Accessories for concrete reinforcing, safety guards, shelving, grilles, etc.; Ryex Standard expanded metal; and Ryex Walkway expanded metal.

RYERSON REINFORCING STEEL-SERVICE

Joseph T. Ryerson & Son, Inc., Chicago, Milwaukee, St. Louis, Detroit, Cleveland, Cincinnati, Buffalo, Boston, Jersey City, Philadelphia.

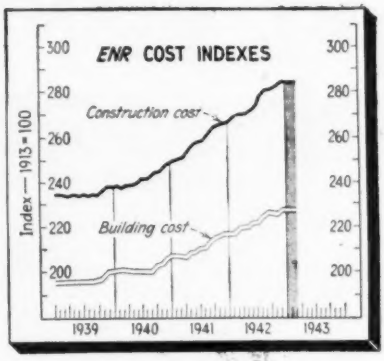
WPB Conservation Division under Materials Substitution and Supply, Lists Reinforcing Bars as a Group II material.

ONTHLY CONSTRUCTION BUSINESS SUMMARY

R CONSTRUCTION VOLUME AND NEW CAPITAL . . . FHA MORTGAGES

(000 omitted)	January 1942 (5 wk.)	January 1943 (4 wk.)	% Change†	Dec. 1942 (5 wk.)	Jan. 1943 (4 wk.)	% Change†
Construction	$628,780	$226,826	−55.0	$373,622	$226,826	−24.0
Construction	51,121	15,498	−62.0	13,279	15,498	+46.0
Construction	577,659	211,328	−54.0	360,343	211,328	−27.0
	497,100	199,256	−50.0	344,895	199,256	−28.0
New Productive Capital	$559,914	$4,498	−99.0	$15,063	$4,498	−63.0
Investment	98,614	2,998	−96.0	14,063	2,998	−73.0
(non-federal work)	11,300	1,500	−83.0	1,000	1,500	+88.0
(federal work)	450,000	.....	.....	.....	.....	.....
Mortgages Selected for Appraisal (Title II)	$54,667	$13,490	−75.0	$37,465	$13,490	−64.0
(Title VI)	38,622	34,695	−10.0	28,656	34,695	+21.0

†Adjusted for difference in number of weeks.



CONSTRUCTION COSTS . . . . . WAGE RATES . . . . . PRICES

	February 1942	February 1943	% Change	Change January to February 1942 Jan.	1942 Feb.	%	Change January to February 1943 Jan.	1943 Feb.	%
Construction Cost ..., 1913 = 100‡	269.41	283.48	+5.2	267.63	269.41	+0.7	283.45	283.48	*
Building Cost Index, 13 = 100‡	218.44	226.90	+3.9	217.12	218.44	+0.6	226.87	226.90	*

‡Does not reflect increased costs due to more overtime, lower labor efficiency, delivery delays, etc.

ENR 20-CITIES' AVERAGE

mon Labor	$0.780	$0.832	+6.7	$0.776	$0.780	+0.5	$0.832	$0.832	0
ed Labor (Av. 3 trades)	1.536	1.606	+4.6	1.531	1.536	+0.3	1.606	1.606	0
layers	1.638	1.700	+3.8	1.626	1.638	+0.7	1.700	1.700	0
ctural Ironworkers	1.599	1.661	+3.9	1.599	1.599	0	1.661	1.661	0
enters	1.370	1.457	+6.4	1.370	1.370	0	1.457	1.457	0
nt, per bbl	$2.60	$2.60	0	$2.60	$2.60	0	$2.60	$2.60	0
foreing steel, cwt	2.61	2.70	+3.5	2.61	2.61	0	2.70	2.70	0
t. steel shapes, base	2.10	2.10	0	2.10	2.10	0	2.10	2.10	0
per ton	1.21	1.21	0	1.20	1.21	+0.8	1.21	1.21	0
ber, 2x4 Fir, per M ft.	47.57	51.47	+8.2	46.74	47.57	+1.8	51.47	51.47	0
ber, 2x4 Pine, per M ft.	41.74	44.03	+5.5	40.76	41.74	+2.4	43.97	44.03	+0.1
, common, per M	15.28	15.66	+2.5	15.21	15.28	+0.5	15.66	15.66	0
y-mixed concrete, c.y.	7.20	7.38	+2.5	7.17	7.20	+0.4	7.38	7.38	0
t, clay tile, 3x12x12	75.83	78.93	+4.1	75.65	75.83	+0.2	78.93	78.93	0
g asphalt, cars, ton	15.28	14.88	−2.6	15.21	15.28	+0.5	14.88	14.88	0

Less than .05 percent change.

ENR INDEX NUMBERS

Base = 100	Construction Cost 1913	1926	Building Cost 1913	1926	Volume '13	'26
Feb., 1943	283.48	136.27	226.90	122.66	.....	.....
Jan., 1943	283.45	136.25	226.87	122.64	172	76
Dec., 1942	283.69	136.37	226.63	122.51	227	100
Nov., 1942	283.64	136.35	226.58	122.48	462	202
Oct., 1942	282.44	135.77	225.90	122.11	421	185
Sept., 1942	281.61	135.37	225.46	121.88	544	238
Aug., 1942	281.61	135.37	225.39	121.84	622	273
July, 1942	277.65	133.46	223.45	120.79	736	323
June, 1942	274.19	131.80	221.18	119.56	752	330
May, 1942	272.30	130.89	220.14	119.00	821	360
April, 1942	271.78	130.64	219.55	118.68	569	249
Mar., 1942	269.71	129.65	218.88	118.32	578	253
Feb., 1942	269.41	129.51	218.44	118.08	507	223
Jan., 1942	267.63	128.65	217.12	117.37	402	176
1942 (Av.)	276.31	132.82	222.39	120.22	553	243
1941 (Av.)	257.84	123.95	211.46	114.32	375	164
1940 (Av.)	241.96	116.31	202.81	109.64	269	118
1939 (Av.)	235.51	113.21	197.44	106.73	211	92

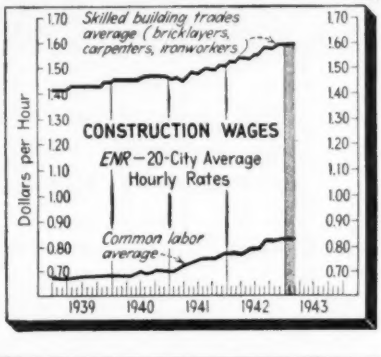
MATERIAL SHIPMENTS . . . . . BUILDING PERMITS

	January 1942	January 1943	% Change	Dec. 1942	% Change Dec.-Jan.
(% operating capacity) A. I. S. I.	94.9	99.3	+4.6	97.9	+1.4

	December 1941	December 1942	% Change	Twelve Months 1941	Twelve Months 1942	% Change
ricated structural steel, tons, A.I.S.C.	176,126	145,280	−17.4	2,251,089	2,039,966	−9.3
ent, thous. bbl., U. S. B. of M.	11,511	8,923	−22.5	167,508	185,167	+10.6
ding Permits, Dun & Bradstreet ,000 omitted)	$93,857	$38,847	−58.6	$1,463,274	$797,223	−45.5

COST OF LIVING INDEXES . . . . . EMPLOYMENT

	December 1941	December 1942	% Change	Nov. 1942	% Change Nov.-Dec.
t of Living Index, N. I. C. B.	93.2	101.0	+8.4	100.3	+0.7
t (Housing) Index, N. I. C. B.	89.9	90.8	+1.1	90.8	0
al Employment (est.) thous., B. L. S.	36,088	38,956	+8.0	38,533	+1.0
truction Employment (est.) thous., B. L. S.	1,880	1,726	−8.0	1,896	−9.0



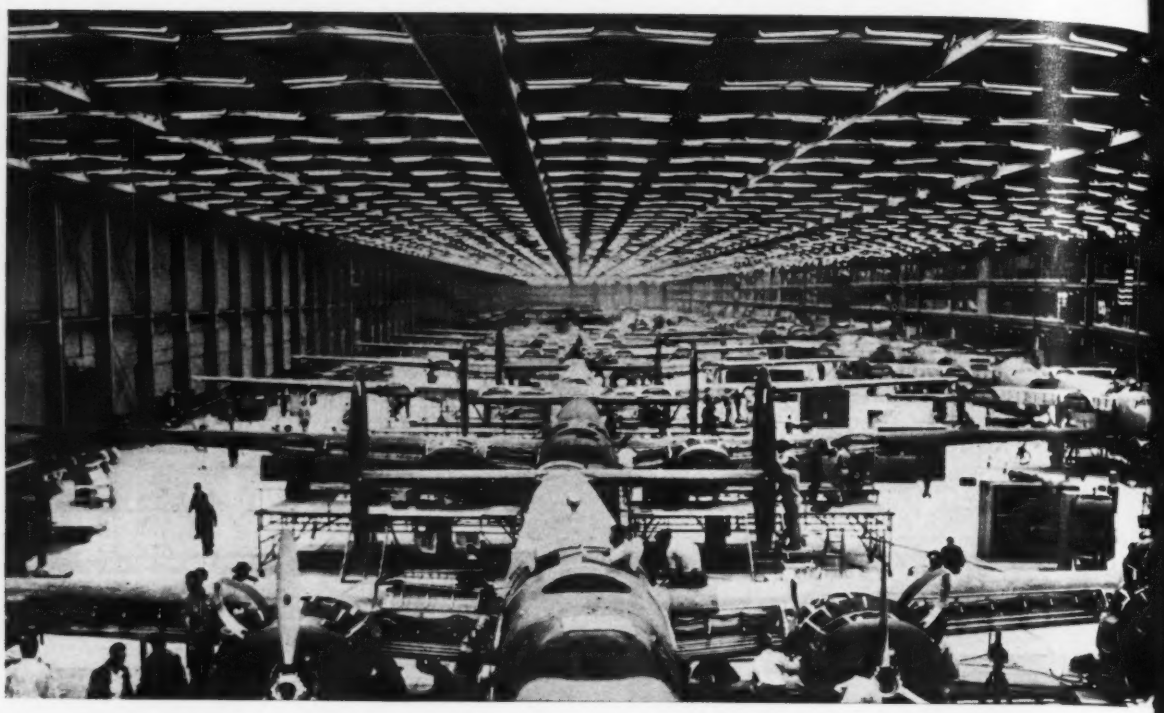
ENGINEERING CONTRUCTION CONTRACTS——ENGINEERING NEWS-RECORD——JANUARY 1943

Engineering News-Record *reports projects of the following minimum costs—waterworks, excavation, drainage and irrigation,* $15,000; *other public works,* $25,000; *industrial buildings,* $40,000; *other buildings,* $150,000

Four Weeks—Thousands of Dollars (000 Omitted)

	New England	Middle Atlantic	South	Mid West	West of Mississippi	Far West	United States January 1943	United States January 1942	Canada
Public Works									
Waterworks	505	121	984	136	2,222	516	**4,484**	6,781	335
Sewerage	110	172	322	131	1,428	480	**2,643**	7,634	40
Bridges, public	.....	.....	1,066	592	138	175	**1,971**	8,669	.....
Earthwork and waterways	350	65	432	.....	367	174	**1,388**	113,629	150
Streets and roads	50	2,809	5,650	780	4,748	2,449	**16,486**	33,204	27
Buildings, public	5,859	4,796	46,185	5,103	37,830	38,995	**138,768**	311,297	2,865
Unclassified, public	3,105	9,778	5,706	675	15,028	11,296	**45,588**	96,445	4,971
Total public	**9,979**	**17,741**	**60,345**	**7,417**	**61,761**	**54,085**	**211,328**	**577,659**	**8,388**
Federal government (included in above classifications)	**9,739**	**16,370**	**54,298**	**6,034**	**60,406**	**52,409**	**199,256**	497,100	.....
Private									
Bridges, private	.....	.....	.....	.....	1,500	.....	**1,500**	92	.....
Industrial buildings	635	1,790	.....	1,306	580	631	**4,942**	19,700	1,143
Commercial buildings	1,640	3,886	172	150	1,038	1,488	**8,374**	26,342	.....
Unclassified, private	25	53	.....	15	444	145	**682**	4,987	.....
Total private	**2,300**	**5,729**	**172**	**1,471**	**3,562**	**2,264**	**15,498**	**51,121**	**1,143**
Total Engineering Construction:									
January, 1943 — 4 weeks	**12,279**	**23,470**	**60,517**	**8,888**	**65,323**	**56,349**	**226,826**	.....	**9,531**
December, 1942 — 5 weeks	28,080	39,954	139,434	32,519	57,218	76,417	**373,622**	.....	12,449
January, 1942 — 5 weeks	24,274	140,757	229,508	88,743	78,558	66,940	.....	628,780	7,856

PLANE PRODUCTION SPEEDED BY GIANT LIGHT REFLECTOR



White cement floor reflects 61% more light on the under side of bomber wings and fuselages...20% more light on vertical working surfaces. This type of floor used in Boeing, Consolidated, Douglas and North American plants.

LIGHT-REFLECTING FLOORS, made with Atlas White Cement, are acting today as giant reflectors and diffusers of light in essential war plants. They chase shadows from production and assembly lines. According to tests by General Electric in Consolidated Aircraft plant, this type of floor reflects 61% more light on under-side surfaces of planes than does the gray concrete floor in the same plant. These tests also showed that the white cement floor produces 20% more illumination on vertical work surfaces than does the gray cement floor.

By providing this increased illumination, light-reflecting floors help employees operate with greater speed and safety . . . reduce errors and spoilage of materials. They sharpen the vision of workers who have defective sight . . . of older men and of new workers who are working at a machine for the first time.

White cement floors in aircraft plants for Boeing, Consolidated, Douglas and North American are showing their superiority over darker floors. In installations already made they have repaid their initial cost quickly. They can be cleaned and kept white simply and economically.

Write for a new book, "LIGHT FROM FLOORS." It tells about the advantages of better illumination and gives detailed information on the construction, maintenance and value of light-reflecting floors made with Atlas White cement. Universal Atlas Cement Company (United States Steel Corporation Subsidiary), Chrysler Building, New York City.

• • •

OFFICES: *New York, Chicago, Philadelphia, Boston, Albany, Pittsburgh, Cleveland, Minneapolis, Duluth, St. Louis, Kansas City, Des Moines, Birmingham, Waco.*

ATLAS WHITE CEMENT

FOR LIGHT-REFLECTING FLOORS

Universal Atlas Cement Company
Chrysler Building, New York, N. Y.

Please send me copy of new book, "Light from Floors." ENR-2

Name_____

Position_____

Company_____

Address_____

The Week In Engineering and Construction

ENGINEERING NEWS-RECORD • FEBRUARY 11, 1943 • VOLUME 130 • NUMBER 6

Armed services announce list of training schools

First list of schools approved for technical training of servicemen made public by War Manpower Commission's Bureau of Training. Additions to be made at a later date

A list of 281 colleges and universities have been selected for the training enlisted men of the Army and Navy made public on Feb. 7 by the Joint committee for Selection of Non-Federal cational Institutions, representing the my, Navy and War Manpower Com-sion. These schools are to be used as t of the training program announced December (*ENR*, Dec. 24, p. 877). ditional schools will be announced at ter date.

All contracts entered into by the Army Navy before the new training program announced will remain in force. ere are between 600 and 700 of these erating at non-federal institutions.

Each of the services has developed its n program for utilizing college facili-s. The Army intends to put selected diers through short intensive courses a few specialized subjects. The Navy the other hand expects to send certain its men to take what amounts to an breviated version of a college educa-n, including some of the "cultural" jects. Still in preparation are plans a similar program for government-anced education of technical men eded by the war industries.

The colleges selected for engineering ining for the Army and the Navy are en in the following tables. The com-te list includes schools to be used for ining Army Aviation Cadets, chap-ns, etc. The symbols (A) and (N) in e table indicate whether Army or Navy gineer training is to be given at the hools.

bama Poly. Inst.	(A)
v. of Alabama	(A)
versity of Arizona	(A)
v. of Arkansas	(A)
lifornia Inst. of Tech.	(N)
v. of California	(A) (N)
nford Univ.	(A)
v. of Santa Clara	(A)
v. of So. Calif.	(N)
v. of Colorado	(N)
lorado School of Mines	(A)
lorado State College	(A)
v. of Denver	(A)
v. of Connecticut	(A)
Yale University	(A) (N)
Univ. of Delaware	(A)
Geo. Washington Univ.	(A)
Catholic University	(A)
Howard University	(A)
Univ. of Florida	(A)
Georgia School of Tech.	(A) (N)
Univ. of Idaho	(A)
Illinois Inst. of Tech.	(A) (N)
Univ. of Illinois	(A) (N)
Northwestern University	(N)
Purdue University	(A) (N)
Rose Polytechnic	(A)
Iowa State College	(A) (N)
Univ. of Iowa	(A)
Kansas State College	(A)
Univ. of Kansas	(A) (N)
Univ. of Kentucky	(A)
Univ. of Louisville	(N)
Louisiana State Univ.	(A)
Tulane Univ.	(N)
University of Maine	(A)
Johns' Hopkins Univ.	(A)
Univ. of Maryland	(A)
Harvard Univ.	(A)
Mass. Inst. of Tech.	(A) (N)
Northeastern Univ.	(A)
Worcester Poly. Inst.	(N)
Tufts College	(N)
Michigan College of M. & T.	(A)
Michigan State College	(A)
Univ. of Detroit	(A)
Univ. of Michigan	(A) (N)
Univ. of Minnesota	(A) (N)
Mississippi State	(A)
Univ. of Missouri	(A) (N)
Washington Univ.	(A)
Missouri School of Mines	(A)
Montana State College	(A)
Montana School of Mines	(N)
Univ. of Nebraska	(A)
Univ. of Nevada	(A)
Univ. of New Hampshire	(A)
Dartmouth College	(N)
Newark College of Engr.	(A)
Princeton University	(A)
Rutgers Univeristy	(A)
Stevens Institute	(N)
New Mexico A. & M.	(A)
Univ. of New Mexico	(N)
New Mexico Sch. of Mines	(A)
Brooklyn Poly.	(A)
Clarkson College	(A)
College of City of N. Y.	(A)
Cooper Union	(A)
Cornell University	(A) (N)
Manhattan College	(A)
Alfred University	(A)
New York Univ.	(A)
Pratt Institute	(A)
Syracuse Univ.	(A)
Columbia Univ.	(N)
Rensselaer Poly.	(N)
Union College	(N)
Univ. of Rochester	(N)
Webb Institute	(N)
North Carolina State	(A)
Duke University	(N)
North Dakota Agri.	(A)
Univ. of North Dakota	(A)
Ohio State	(A)
Univ. of Akron	(A)
Univ. of Cincinnati	(A)
Case School	(N)
Oklahoma A. & M.	(A)
Univ. of Okla.	(A) (N)
Univ. of Tulsa	(A)

(*Continued on page* 91)

Sovfoto

Russians repair bridge destroyed by enemy

In the wake of victorious Russian armies pushing westward, Russian engineer regiments are moving up rapidly to repair damage wrought by the retreating enemy.

The bridge above, near Smolensk, on the central front, carried a main line railroad track across a small stream. It was split almost exactly in half by bombs set off by enemy troops. Engineers have jacked the structure back to its original position and are now engaged in restoring the floor and the damaged center section.

J. S. Macdonald becomes president of the Moles

Rear Admiral Moreell and Frank Barnes given Moles achievement awards.

John S. Macdonald, project manager of Contractors for Drydocks, last week was installed as president of the Moles—New York heavy construction men's organization—succeeding Alexander Lyle, chief engineer of the Carleton Company. Also elected to office were Arthur A. Johnson, contractor, first vice-president and Alfred N. Warwick, contractor, second vice-president. Ralph W. Atwater of the Shultz Dredging Corp. was re-elected secretary-treasurer.

At the same meeting, the annual Moles Award for Outstanding Achievement in Heavy Construction was formally presented to Rear Admiral Ben Moreell (CEC) USN, chief of the Bureau of Yards and Docks, U. S. Navy; and to Frank W. Barnes, now project manager on work in New England and off-shore bases for Geo. A. Fuller Co. and Merritt Chapman & Scott Corp. (*ENR*, Nov. 12, 1942, p. 681). About 900 construction men attended the dinner at which the awards were made.

Previous recipients of the Moles award are: Robert Moses, city and state planner of New York; John S. Macdonald, of Contractors for Drydocks; M. J. Madigan, consulting engineer and now consultant to the Undersecretary of War,

John S. Macdonald

and Edmund A. Prentis of Spencer White & Prentis, Inc., foundation contractors.

Formal awards are usually in the form of an embossed parchment and a bronze plaque. This year's recipients were given a "rain-check" on the plaque, to be made good when bronze is again available for other than war use.

City seeks to block WPB removal of street rails

Condemning the action of the War Production Board as "arbitrary, capricious and unreasonable," the city of Memphis, Tenn., last week began court action to block the removal of about 1,500 tons of rails embedded in railway crossings in the city.

Federal Judge Marion Boyd set no date for rendering an opinion on the city's plea for a permanent injunction preventing War Materials, Inc., from carrying out a WPB directive to reclaim the steel for salvage. Action on a condemnation order by the agency was blocked recently when Judge Boyd granted the city's plea for a temporary injunction.

In asking the permanent injunction, John L. Exby, city attorney, questioned the authority of a federal agency to condemn public property already in use.

Commissioner O. P. Williams of the Department of Public Works testified that the rails, sunk in concrete, made crossing smoother and prevented cracks and holes from appearing. He said city traffic would be paralyzed if all the rails were removed at once. Mayor Walter Chandler and other witnesses added testimony that the city had located 2,700 tons of rails above ground in abandoned side tracks.

WPB cuts more projects from war program

Following its policy of curtailing construction that does not contribute directly to the war effort (*ENR*, Jan. 21, p. 100, and previous), the War Production Board said that during the past two weeks projects having a total cost of $56,538,412 were stopped.

This brings to $1,271,389,309 the total cost of all projects that have been halted since October 23, 1942, by either the War Production Board or the programming agency.

The cost of projects stopped during the week ending January 22 was listed as $56,344,612; the cost of projects stopped during the week ending January 29 was listed as $193,800—the smallest weekly total since the WPB's Facility Review Committee was established.

• • •

Seattle awards contract for raising Ross Dam

Subject to the approval of the Federal Power Commission, the Seattle (Wash.) Board of Public Works has awarded a $7,144,922 contract for construction of the second step of the Ross storage dam on the Skagit power project. The work is to be carried out jo[illegible]ly by the [illegible] eral Construction [illegible] of Seat[illegible] Morrison-Knudsen Co., [illegible] of Boise, Ida[illegible] and the J. F. Shea Co. [illegible] of San Franci[illegible] Calif.

The board received tw[illegible] other bids [illegible] letting January 21, on[illegible] from Gu[illegible] Atkinson of San Franci[illegible] for $8,018,6[illegible] and another from S. A. Healey of W[illegible] Plains, N. Y., at $10,01[illegible],306.

Second call for bids

This is the second time bids have b[illegible] received for the projec[illegible]. At the [illegible] opening, the General-Morrison-Knud[illegible] Shea combination asked $6,146,214, w[illegible] a separate bid by the Superior Portla[illegible] Cement Co. of $977,678 for cem[illegible] These figures were rejected as exceedi[illegible] the funds available. Since then, a gra[illegible] has been secured from the Federal Wor[illegible] Agency and bids called for the new co[illegible] tract, which includes furnishing the e[illegible] ment and equipment as well as pe[illegible] formance of the work. Specificatio[illegible] were changed to include a concre[illegible] cooling system, and to cover increas[illegible] amounts of rock excavation, cement a[illegible] concrete.

General Construction Co. and J. [illegible] Shea Co. participated in construction [illegible] the first step of the dam—a concre[illegible] variable arch structure. The new contra[illegible] will increase the height of the dam fro[illegible] Elevation 1380 to Elevation 1545, i[illegible] pounding an additional 578,000 acre [illegible] of water.

• • •

PRA records continuing highway travel drop

Traffic on rural highways was off [illegible] percent in the newly rationed area and [illegible] percent in the eastern rationed area i[illegible] December, as compared with the sam[illegible] month a year ago, according to the Pub[illegible] lic Roads Administration.

The counts were taken by 43 state high[illegible] way departments on more than 50[illegible] "electric eye" recorders.

The 49 percent decline in traffic o[illegible] rural roads in the East in December com[illegible] pares with declines of about 42 percen[illegible] the previous two months, and is a[illegible] counted for in part by the elimination [illegible] Christmas pleasure driving, reduced valu[illegible] of gas coupons, and the week-end gas[illegible] line "freeze" late in the month. PR[illegible] said. The 48 percent decline in the new[illegible] rationed area compares with decreases [illegible] about 23 percent in previous months.

Cost of converting eleven Milwauk[illegible] city owned buildings from oil to co[illegible] burning heating plants would be $47,35[illegible] according to a report by Manual Cutle[illegible] superintendent of bridges and building[illegible]

raffic moves on new orthwest Canada roads

Alberta, Canada, government sman, quoted by the Canadian Association, revealed last week that from Edmonton was proceeding as Hay River, Yukon Territory, at the end of Great Slave Lake, using constructed road links connecting ern Alberta with the Northwest tories.

spokesman said supplies for north- ad projects were now being moved ck convoy over this route.

372-mile road from Grimshaw in ern Alberta has been put through y River and is now being extended rovidence—where the Mackenzie flows from Great Slave Lake.

s work was said to have been done S. government crews to enable to get supplies into the north ry for projects not along the route newly-completed Alcan Highway—lies some 275 miles to the west.

nt reports said another new road between Hay River and Fort Smith, miles southwest of Hay River, also under construction.

e construction of a new highway of the Peace River in the Mackenzie River area by the United States government was disclosed in the Canadian se of Commons at Ottawa recently. e Minister King said that the new system as well as the Alcan Highway will be handed over to Canada after war.

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WA had "best year" in 1942, Fleming reports

he Federal Works Agency, fully con- ed to war activities, had its "best " in 1942, as measured by the unt of new work completed and the e of that work to the nation, accord- to an annual report submitted to gress by Maj. Gen. Philip B. Flem- administrator.

onversion was characteristic through- the agency and its constituent or- izations. The Public Buildings Ad- istration concentrated on quick, eco- ical, temporary construction of of- buildings for war bureaus, hospitals dormitories; the Public Roads Ad- istration gave chief attention to more 600 access roads to key war plants military and naval establishments, Alcan Highway, additional construc- on the Pan-American Highway and r work; and the Office of the Federal ks Administration pressed a program ar public works or community facili- and the preparation of a shelf of jects for postwar construction.

Funds voted for Navy's mobile drydock work

A bill authorizing the construction of floating drydocks that could accompany American and other allied navies to combat areas was passed by the House of Representatives last week by a voice vote.

The bill would make available $210,000,000 to provide docks for cruisers and vessels of similar size, for destroyers, and for patrol ships. There would be five built for cruisers at a cost of $56,500,000; 18 for destroyers at a cost of $54,000,000, and 25 for patrol craft at a cost of $22,500,000. The remaining $77,000,000 would be used for collateral facilities and incidental work.

Navy experts two weeks ago had asked the House for the funds (*ENR*, Feb. 4, p. 153) on the ground that there is a pressing need for increased drydock facilities all over the world to aid in prosecution of the war. The Navy estimated that the drydocks in the program would be completed within 20 months, without tresspassing upon other projects.

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Oil line 82 miles long completed in Ohio

Jesse Jones, Secretary of Commerce, last week announced completion of the 82-mile, 8-in. oil pipeline extending from a point near Fostoria, O., to near Akron, O. (*ENR*, Oct. 15, 1942, p. 518).

The $1,400,000 project, sponsored by the Defense Plant Corporation, is to be operated by the Ohio Emergency Pipeline Co., jointly owned by the Standard Oil Co. of Ohio, Sun Oil Co., and Shell Oil Co. It will serve as a connecting link between pipelines heretofore in existence owned by Standard Oil and Sun Susquehanna Products Co.

Construction started in August, 1942.

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Pennsylvania sets flood cost over two millions

The damage caused by floods in Pennsylvania in 1942 resulted in damage to the state's roads and bridges of $2,341,591, the state Department of Highways said last week.

The department said that 167 bridges and other structures were damaged, and 69 destroyed in ten storms from May 23 to September 27. To date, 125 of the structures damaged have been restored to service, and 42 are still under repair. Of the bridges destroyed, five have been rebuilt, ten have been placed under contract for reconstruction and others are in the planning stage. Thirty-seven temporary bridges have been put in service.

The highway department divided the 1942 damage into $1,288,904 for roads and $1,052,687 for bridges.

Acme Newspictures

Island airfield repaired for fighters

The road-roller brigade shown above crushes stones gathered and spread by peasant women who are working to keep Allied airfields on the Cyprus in topnotch shape.

The women, several of whom are shown above, gather the stones by hand, break them into small sizes with hammers and then are used as labor crews to spread the material evenly for roller treatment.

The island, in mid-Mediterranean, has been a major base of operations for the Royal air force and other allied air operations.

WASHINGTON HIGHLIGHTS

Pipe for big oil line produced at record rate

Production of pipe for the eastern portion of the Texas-East Coast oil pipeline at the National Tube Co.'s Lorain, Ohio, works, is now at the record pace of 5.8 miles a day, according to the Petroleum Administration for War.

Having completed delivery of pipe for the western portion of the line in exactly four months from the time production began, National Tube immediately started turning out the main line material to complete the eastern segment of the project, which will bring Texas crude and fuel oil to the East Coast area (*ENR*, Jan. 28, p. 106).

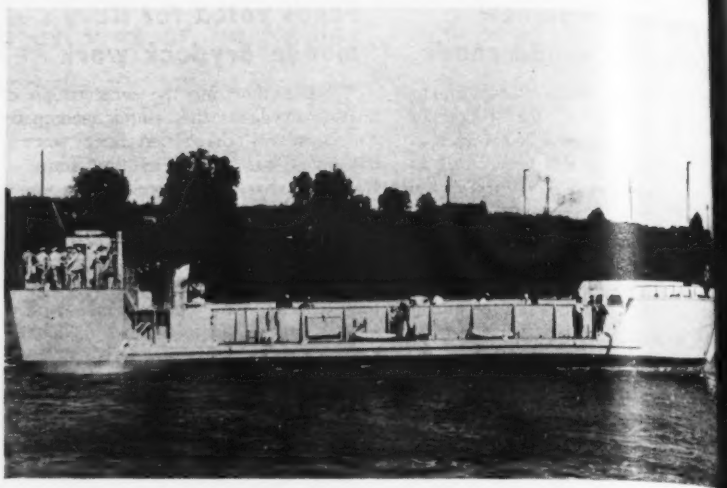
EXTENSION to three Pacific Coast States of the program for concentration of reinforcing bar production in steel rail re-rolling mills was announced recently by H. G. Batcheller, Director of the WPB Steel Division. Earlier this month WPB announced that no reinforcing bars would be made from new steel except those that could not be supplied by re-rolling mills because of size or specification requirements. At the time of the original announcement, the states of Washington, Oregon and California were exempted from terms of the program because rail steel production facilities in those states are relatively small. Because of the continuing downward trend of demand for reinforcing bars, however, it is now felt that the re-rolling mill capacity available will be sufficient to take care of requirements in those states.

OAKLAWN, INC., a New Orleans, La., construction firm, has been denied priority assistance for the next six months by WPB for alleged failure to observe agreements entered into when preference ratings covering defense housing projects were granted the company last March. WPB said the construction company undertook to give preference in occupancy to defense workers who wished to rent, but in violation of the terms under which preference ratings had been authorized, sold 23 of the 110 houses it planned to erect before work on them was started.

SUPERSEDING all previous critical lists, the War Production Board last week released the seventh issue of the Material Substitutions and Supply list. Zinc, chromium, methyl methacrylate, benzol and derivatives, methyl alcohol, birch and Douglas plywood are among materials that have become more critical in supply since Nov. 2, when the previous list was issued. Current supplies of more than 200 basic materials are insufficient for war and essential civilian demands, the list reveals, and in a number of cases for war demands alone.

ALL MANUFACTURERS of portable roll crushers are permitted to build the five sizes listed in Schedule II of Limitation Order L-217 under terms of the schedule as amended last week by the Director General for Operations. Schedule II originally restricted the manufacture of portable roll crushers to persons currently producing the sizes listed. This restriction is now revoked.

AN ENGINEERING license law for the District of Columbia has been introduced into Congress. Similar bills have been introduced at every recent session of Congress, but disagreement over provisions has prevented enactment. The present bill would grant licenses in specific branches—civil, electrical, etc. Two types of license would be granted—"engineer" and "professional engineer," the difference being that the professional engineer agrees not to have any financial interest in firms producing products used in his designs.



Contractors win award for Navy barge building

The Army-Navy "E" award has been presented to Quincy Barge Builders of Quincy, Ill., for outstanding performance in building tank landing barges of the type above for the Navy. The firm is a combination of Bates & Rogers Construction Corp., Chicago; Mississippi Valley Structural Steel Co., St. Louis; and Stupp Bros. Bridge and Iron Co., St. Louis.

These contractors not only switched from heavy construction and bridge building to barge building, but did it so successfully that their contract was finished far ahead of schedule. The barges, of all-welded construction, were fabricated in the plants of the Missis Valley and Stupp companies and assem at Quincy. Hulls were prefabricated in sections, each as large as shipping faci would permit, and shipped to the asse yard, which was staffed by Bates & Rogers assembled barges were launched and equipped for delivery under their own po

Rear Admiral W. C. Watts, U.S.N. (R and Col. John T. Rhett, represented the N and Army, respectively, at the award ce monies. Quincy Barge Builders are contin with another navy contract.

WPB names Dresser chief of construction division

Ferdinand J. C. Dresser, of Clevela has been appointed director of the W Production Board's Construction Divisi succeeding William V. Kahler, who signed recently (*ENR*, Jan. 14, p. 18).

Before accepting the position, M Dresser was in charge of the engineeri section of the Army Specialist Cor where, with the rank of colonel, he h been responsible for the selection of en neer personnel qualified for commissi ing in the specialist corps.

• • •

McCallum named head of OCD sanitary service

Gordon E. McCallum, sanitary engine who has been acting as assistant ch sanitary engineer for the Office of Civili Defense, has been named acting ch sanitary engineer, the U. S. Publ Health Service said last week.

Sanitary Engineer Ralph E. Tarbe of the Public Health Service, who h been chief sanitary engineer for the OC since August, 1941, has been recalled the Public Health Service by t Surgeon-General.

To curb speculation in Columbia Basin lands

Bills to curb speculation in land to be rigated as part of the Columbia Basin oject were recently reported favorably committees of the House and Senate. The Columbia Basin project—now held until the end of the war—provides for irrigation of a huge tract of land with ter from Grand Coulee reservoir. The nate version of the bill would include ovision for a broadly-planned develop-ent of the area by the Bureau of Recla-tion, but this is unlikely to get by the ouse.

Common to both bills is the desire to event speculators from buying the un-rigated land at a "dry" price and then, hen the project is built, re-selling the nd at a high "wet" price. To prevent is, the bills empower the bureau itself buy land at the "dry" price and then -sell the settlers in 160-acre tracts. The -sale would be subject to such condi-ons as the bureau might set—presum-bly forbidding subsequent sale at a price reater than the dry price plus the lue of improvements.

This would give the bureau a rather ore direct control over speculation than es its present practice of requiring a fund to the reclamation district of a ortion of any speculative profits as a ndition for the delivery of water.

The Senate bill, in addition, would uthorize the bureau to make improve-ents to the land it buys before re-selling . This would open the way for a heme of the bureau's to develop the hole irrigated area according to an in-grated regional plan. A bill containing is feature was passed by the Senate last ar but was knocked out by the House. xpectation is that the House bill will revail this time.

• • •

Connecticut sees deficit in future road funds

A book deficit of $2,000,000 in the onnecticut highway fund for the 1943–5 biennium, due to gasoline and tire strictions, is foreseen in a report sub-itted to the governor recently by High-ay Commissioner William J. Cox.

The commissioner asked for return to e highway fund from the state general nd of $1,000,000 expended from high-ay revenues in 1931 to start construc-on of the Merritt Parkway. Other re-uests included in Mr. Cox' report were r permission to charge the Defense ouncil and other state agencies for on-highway work done for these agen-es, and that more money be taken from e Connecticut state general fund and less from the highway fund to defray cost of the state police department.

Mr. Cox asked for appointment of a bi-partisan commission to plan a post war highway program. He said that all major highway construction must halt for the duration, including work on the Wilbur Cross Parkway, improvement of the Boston Post Road and development of the Bridgeport-Waterbury highway.

In recommending a long range highway program for postwar days, the commissioner predicted that cars will be developed to operate more economically and on greater mileage per gallon of gasoline. This, he explained, will complicate highway programs by decreasing tax revenues. To offset this expected decrease, he asked for a basis for allocating town aid funds by mileage of roads in each town instead of according to the present rule that gives large and small towns the same relative amounts.

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London seeks remedy for tight housing conditions

London, England, is facing its worst housing shortage since the end of the last war, according to the British Supply Council in North America.

The shortage results from the fact that London's population, depleted more than two years ago by evacuations, is again rising rapidly as civil servants and office workers flock back wholesale to the city. While these people were away in other parts of the country, air raids destroyed thousands of homes that would otherwise have been available.

Two solutions of the problems have been proposed to the Ministry of Works and Planning and to local housing authorities, with the assertion that if the proposals were adopted, thousands could be accommodated. The proposals are that the Ministry increase the limitation of $400 placed on allowable house repairs, and that the local authorities should give up houses which have been kept reserved for people who have been bombed out of their homes.

In reply, the Ministry has said that there was no likelihood that the $400 limit on repairs would be raised, but added that repairs had been allowed to the utmost extent that labor and materials were available. The value of work sanctioned so far since the limitation order was put into effect has totaled about $208,000,000 and the value of work refused about $96,000,000. Local authorities said that although 35,000 houses in the London area were originally reserved for air raid victims, that number had been considerably scaled down and was constantly under review.

New York reveals new airport as world's biggest

The first detailed description of New York City's new municipal airport—now known as Idlewild Airport—was contained in a report submitted recently to Mayor F. H. LaGuardia by William B. Herlands, commissioner of investigation.

The new airport will have an area of 2,576 acres, about three times the size of Central Park and almost five times the size of LaGuardia Field, which was considered huge when opened in 1939.

The field will have 13 miles of runways for land planes and three landing areas in Jamaica Bay, on the south shore of Long Island, for seaplanes. The runways, each 200 ft. wide, will be laid out in pairs in four different wind directions to permit planes to land and take off simultaneously on each pair of runways. In addition, the airport will have five miles of paved taxi strips 100 ft. wide.

Joseph Meehan chief engineer for the city's Department of Marine and Aviation (formerly Department of Docks), said last week that only construction operations in progress at the field at present are earth fill operations which are now about 65 percent complete. He added that engineers in his department were now preparing plans before calling bids for paving of major runways.

The city undertook construction of Idlewild Airport in 1941, after the Navy took over Floyd Bennett Field.

War Measure

Readers of *Engineering News-Record* will observe that the "trim size" of the current issue of the magazine is slightly smaller than that of previous numbers. The reduction in size has been made to enable the publishers to meet an order of the War Production Board limiting the amount of paper that may be used in 1943. Subscribers will note, however, that no change has been made in size of type or in the amount of editorial content per page, but that a substantial saving in paper has been effected merely by trimming the margins.

The publishers have adopted the new size as a war measure and as a contribution to the conservation of manpower and transportation facilities in the production and distribution of paper. Service to the reader has not been sacrificed and will be maintained as far as humanly possible in the face of the problems confronting all of us in our united efforts to win the war.

BRIEF NEWS

THE PORTLAND General Electric Co. has been order by Ormand R. Bean, Oregon state public utilities commissioner, to make a substantial and unconditional rate reduction in the Portland area, and to establish a reserve fund for the benefit of customers.

BRICKLAYERS Union No. 1 of Arkansas has served notice on all state contractors that its members have voted to continue present wage scales of $1.62½ per hour for an eight hour day, with double time for Saturdays and Sundays and all holidays recognized by the union.

THE SPRINGFIELD, Ill., Housing Authority has received word from Washington saying that the proposed war housing project of 1,850 dwelling units has been reduced to 250 units. The original estimated cost of the project—which also was to have included a schoolhouse for 600-900 children—was $5,000,000.

TEXAS enjoyed the greatest construction year in its history in 1942, according to figures released recently at Fort Worth. Awards for all types of work in 1942 were valued at $825,704,245. Outstanding among war contracts were synthetic rubber plants valued at $93,000,000.

BRIDGES on Fifth Avenue between 23rd and 24th Sts., and at Fifth Alley and 22nd St., were under construction in Bessemer, Ala., last week. Both structures will speed the flow of war traffic through the city.

RECENTLY awarded the Army-Navy "E" for excellence were Brown & Root, Inc., W. S. Bellow Construction Company and Columbia Construction Company for their part in constructing the Naval Air Station at Corpus Christi, Tex.

THE St. Louis, Mo. City Planning Commission has warned the city that the population would drop from its present 850,000 to about 500,000 by 1980, unless there is rehabilitation of obsolete and blighted residential areas.

THE ILLINOIS State Division of Waterways recently completed its tenth year of operating 14 movable bridges and navigation aids on the Illinois deep waterway, with a perfect record of no accidents and no delays to water-borne commerce, according to Maj. Walter A. Rosenfield, director of public works and buildings. Since completion of the waterway in 1933, the state division has been charged with responsibility for operation of bridges between Lemont, Ill., and the mouth of the Illinois river at Grafton.

New York governor asks rise in road repair budget

Making his initial budget address to the New York state legislature recently, Governor Thomas E. Dewey recommended an increase of $2,000,000 in appropriations for maintenance and repair of state highways and restoration of full state aid to towns and counties for similar road repair purposes.

"Because of the war, no extensive highway construction can be undertaken at this time," the governor said, "but our highways must be maintained. They are vital to the transportation needs of our armed services, war industries and commerce.

"As a result of past inadequate appropriations, our highways have deteriorated. Although passenger traffic has declined, heavy trucking which does the most damage, has increased."

Work goes ahead on Yadkin River project

Although the War Production Board has not yet given any indication as to whether it will permit actual construction work to proceed, land surveying and other preliminary work in connection with the High Point, N. C., hydro-electric power plant and dam on the Yadkin River (*ENR*, June 4, 1942, p. 867) is being speeded up, according to Ward Carpenter, project engineer.

WPB has recently issued orders halting work on many projects (*ENR*, Dec. 17, 1942, p. 829) in order to bring the 1943 construction program into line with manpower and material resources.

William Freeman of High Point holds the surveying contract. He is now being assisted in expediting the work by W. R. Holway & Associates consulting engineers of Tulsa, Okla.

JOBS OF THE WEEK

HOUSING, California
Robert McCarthy Co., San Francisco, Calif., was lowest bidder on housing in Contra Costa County, when government agency opened bids. Total estimated cost $12,000,000.

HOUSING, Utah
Public Housing Authority, Kansas City, Mo., received lowest bid for housing projects from J. I. Barnes Construction Co., Salt Lake City, Utah, $2,470,0[illegible] Burns & McDonnell, Kansas City, Mo. are engineers

HOUSING, New York
Niagara Falls Housing Authority, Niagara Falls, awarded housing contract to Wilcox Construction Co. and Bowen Fireproofing Co., Long Island City, $1,319,2[illegible] Association of Licensed Architects, Niagara Falls, architects.

HOUSING, Nebraska
U. S. Engineers, Kansas City, Mo., awarded contracts for two housing projects to Green Brothers Construction Co., Worland, Wyo., $1,027,017 and $447,050 respectively. Fisher & Fisher, Denver, Colo. are architects.

HOUSING, North Carolina
Public Housing Authority, NHA, Atlanta, Ga. awarded housing contract to H. S. [illegible] and F. J. Construction Co., Conover, N. C., $1,249,280. A. J. Maxwell, Jr. Gold[illegible] boro, N. C. and J. J. Rowland, Kinston N. C. are architects.

BUILDING, Wyoming
U. S. Engineer, Omaha, Neb., awarded contract for buildings to Peter Kiewit Sons Co., Omaha, Neb. Estimated cost $1,500,000.

BUILDING, Alabama
R. P. Farnsworth & Co., New Orleans, La., has been awarded contract by U. S. Engineers, Mobile, Ala. for building at estimated cost $5,000,000.

CAR YARDS, Crestline, O.
Pennsylvania R.R. Co., W. D. Wiggins, chief engineer, Philadelphia, Pa. awarded contract for constructing car yards and other improvements to J. C. O'Connor Sons, Inc., Fort Wayne and Ferguson & Edmonson Co., Pittsburgh. Estimated cost $1,000,000.

PLANT, Minnesota
Defense Plant Corp., Washington, D. C. awarded contract for war plant to Standard Construction Co., Minneapolis, Minn. Estimated cost $4,000,000.

FACILITIES, New York and New Jersey
Bureau of Yards & Docks, Washington, D. C. awarded contract additional building facilities in New York metropolitan area to W. J. Barney Corp., New York, $2,714,000.

NOTE—Additional bidding and contract news on many projects large and small appear in the Construction News section beginning on page 243.

OBITURAY

...am Kennedy, 95, one of Canada's ...eer hydraulic engineers, died Jan. ...t Montreal. In his active years, Mr. ...nedy, who retired in 1925, designed ... directed construction of many of ...most important hydraulic, hydroelec- ...and waterworks plants in the Ottawa ...rict and various other parts of ...ario, Quebec and the Maritime ...vinces.

...C. Atwood, 71, civil engineer and ...or partner of the architectural and ...ineering firm of Atwood & Weeks, ... Durham, N. C., died at Durham ..., 3. A native of Provincetown, Mass., ...served in engineering capacities with ... Metropolitan Water Board at Boston; ...h the Department of Water Supply, ... and Electricity in New York City; ...h the Bureau of Filtration at Phila- ...phia, Pa., and among other activities ... construction manager of the Yale ...l at New Haven, Conn.

...uel E. Burd, civil engineer and con- ...ction superintendent with the Piggott ...struction Co. of Hamilton, Ont., died ...ently there.

...n Hunter Manning, Jr., 33, assistant ...gineer with the Corps of Engineers at ...tral Hill Dam in Alabama, died at ...ffield, Ala., Feb. 1.

...bert L. Porter, 64, civil engineer of ...cago, Ill., died Feb. 1.

...vier A. Kramer, 64, engineer, builder ... industrialist of McComb, Miss., died ...re Feb. 4. He was Mississippi's first ...hway engineer, served 12 years as ...yor of McComb, and designed, built ...ny ice plants.

Service training schools

(*Continued from page 85*)

Oregon State College	(A)
Carnegie Tech.	(A) (N)
Drexel Inst.	(A)
Lafayette College	(A)
Lehigh Univ.	(A)
Pennsylvania State	(A) (N)
Univ. of Pennsylvania	(A) (N)
Univ. of Pittsburgh	(A)
Villanova College	(A)
Bucknell Univ.	(N)
Swathmore College	(N)
Rhode Island State	(A)
Brown Univ.	(N)
Clemson Agri.	(A)
The Citadel	(A)
Univ. of South Carolina	(N)
South Dakota A. & M.	(A)
South Dakota Mines	(N)
Univ. of Tennessee	(A)
Vanderbilt Univ.	(A)
Texas A. & M.	(A)
Texas Tech. College	(A)
Rice Institute	(N)
Southern Methodist	(N)
Univ. of Texas	(N)
Univ. of Utah	(A)
Utah State	(A)
Norwich Univ.	(A)
Univ. of Vermont	(A)
Virginia Mil. Inst.	(A)
Virginia Poly.	(A)
Univ. of Virginia	(N)
Washington State	(A)
Univ. of Washington	(A) (N)
West Virginia Univ.	(A)
Univ. of Wisconsin	(A) (N)
Marquette Univ.	(N)
Univ. of Wyoming	(A)

CONTRACTS AND CAPITAL

ENGINEERING CONSTRUCTION volume for the week, $70,939,000, is 13 percent lower than a week ago, and 32 percent below the total for the corresponding 1942 week. Private construction declines 47 percent from the preceding week, and 30 percent from a year ago. Public work is 8 percent below last week, and 33 percent under last year as all types of public work fell off.

The current week's construction brings 1943 volume to $379,561,000, an average age of $63,260,000 for each of the six weeks of the year. On the weekly average basis, 1943 volume is 50.5 percent below the total reported for the seven-week period in 1942. Private construction declines 54.5 percent, and public work is 50 percent lower than last year, when adjusted for the difference in the number of weeks reported.

New capital for construction purposes for the week totals $41,000, and is made up entirely of state and municipal bond sales. The week's new financing brings the 1943 total to $5,447,000 for the six weeks of the year, a volume that compares with $1,104,629,000 reported for the seven-week period last year.

CONTRACTS

(Thousands of dollars)

	Week Ending Feb. 12 1942	Feb. 4 1943	Feb. 11 1943
Federal	$85,149	$70,002	$64,182
State & Municipal	11,801	1,354	1,225
Total public	$96,950	$71,356	$65,407
Total private	7,943	10,440	5,532
TOTALS	$104,893	$81,796	$70,939
Cumulative 1943 (6 weeks)			$379,561
1942 (7 weeks)			$894,763

Note: Minimum size projects included are: Waterworks and waterways projects, $15,000; other public works, $25,000; industrial buildings, $40,000; other buildings, $150,000.

NEW PRODUCTIVE CAPITAL

	Cumulative 1942 7 weeks	1943 6 weeks
NON-FEDERAL	$125,924	$5,447
Corp. Securities	28,190	.....
State & Mun.	83,905	3,947
R.F.C. loans	13,829	1,500
FEDERAL	$978,705	.....
TOTAL CAPITAL	$1,104,629	$5,447

ENR INDEX NUMBERS

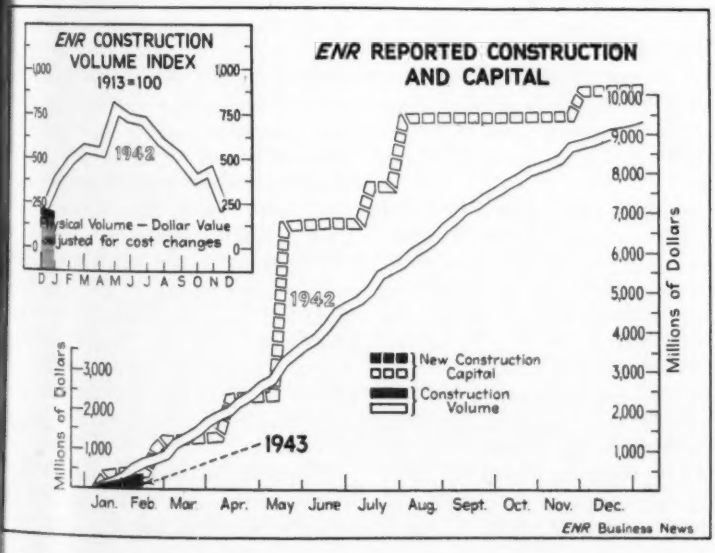
Index Base = 100

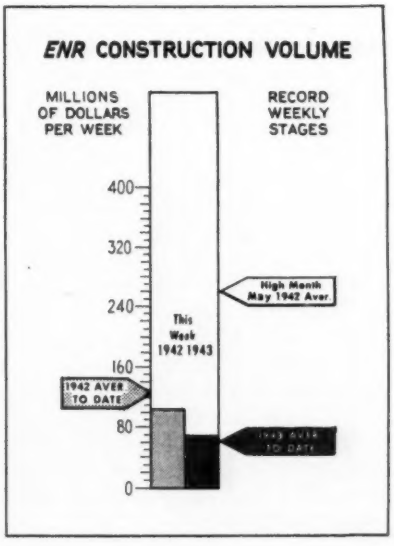
		1913	1926
Construction Cost	Feb. '43	283.48	136.27
Building Cost	Feb. '43	226.90	122.66
Volume	Jan. '43	172	76

FHA MORTGAGES

	Week Ending Feb. 7 1942	Jan. 30 1943	Feb. 6 1943
Selected for appraisal			
Title II	$14,840	$3,716	....*
Title VI	$17,490	$6,732	....*

* Not yet available.


ENR CONSTRUCTION VOLUME INDEX 1913=100
1942
Physical Volume — Dollar Value adjusted for cost changes
J F M A M J J A S O N D
ENR REPORTED CONSTRUCTION AND CAPITAL
Millions of Dollars
New Construction Capital
Construction Volume
1942
1943
Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec.
ENR Business News


ENR CONSTRUCTION VOLUME
MILLIONS OF DOLLARS PER WEEK
RECORD WEEKLY STAGES
High Month May 1942 Aver.
This Week 1942 1943
1942 AVER TO DATE

Comment and Discussion

Readers' opinions on matters that concern engineers and contractors

WPA Wasteful and Political

Sir: The WPA, its worth, uselessness and ramifications can be discussed endlessly. As a non-federal public official who for the past ten years has been in charge of local relief work initiated by the county, state and federal governments, I can truthfully state that the federal relief projects have been the most wasteful, inefficient and political controlled of all. I could cite hundreds of incidents, but this would serve no useful purpose, as every other local public official could do the same. Past history on relief work can be useful only if its record can be wisely used in planning for the future.

To me the main defect of a federal WPA or other such relief administration, is its pernicious political control. To deny that such control has existed shows either lack of knowledge of federal work-relief affairs, or else an approval of the premise that to the political victor belongs the spoils. In my knowledge, federal politics and its influence on state, county and local politicians was the controlling factor in causing most of the confusion, inefficiency and wastefulness of the WPA effort.

It would be extremely absurd to claim there would be no local political manipulation if local authorities had full jurisdiction over the finances and operations of work-relief projects. Past experience, however, definitely shows that local jurisdictions have performed more effectively on their own than under federal control.

In my opinion, if funds are to be furnished by the federal government for general unemployment relief, the best results will be secured by making direct grants to the various states and then permitting them to plan, direct and control their own relief projects. The states in turn can make the proper and necessary allocations to their various political subdivisions, and in this manner the actual expenditure of the money will be in local hands where the elected public officials are close to the voters and can be retained or rejected on their records of performance.

As a matter of fact, no federal funds should be used at all for such purposes, as work relief projects should be financed entirely by the various states with an allocation of costs or taxes to the political subdivisions in proportion to the state funds used. This is simply applying the principal of "home rule", which the country by now must appreciate is the true way of living the American life.

Bureaucratic control from Washington must be eliminated from work relief projects of any nature, if the best interests of our unemployed are to be protected and preserved, and if the public funds of the people are not to be politically and shamefully wasted.

ARTHUR RICHARDS
Engineer-Executive
Larchmont, N. Y.

WPA Helped Small Towns

Sir: After reading the editorial in the Dec. 17, 1942, issue of *Engineering News-Record* I cannot resist the temptation to offer some defense for WPA in my humble way.

WPA, as well as any other undertaking, can be justly criticized from some angle, but I rather think your criticism was based on personal or political feeling, as you left no doubt that in your opinion it was all wrong and so horrible that we should harbor no part of it in our memories. Are you so absent minded, that you fail to remember there was nothing better offered at the time to prevent hunger for millions of good honest American people.

I do think you should be more considerate of a movement that prevented millions of people from going hungry, especially the thousands of undernourished children which you know existed at the time public assistance was started, and besides providing work for heads of families and aiding them to maintain the American standard of living. I wish to point out a few things provided by WPA that I cannot consider as waste, for example in the little village in which I live (population 800) we now have a water system, (furnishing pure drinking water instead of using water from contaminated wells) storm sewers and approximately three miles of hard surfaced streets which we could not have hoped for had it not been for WPA; also our school children regardless of race, color or creed have been furnished with well-balanced meals at school for prices ranging from three to six cents per meal or if children were financially unable to pay they were given meals free of charge; also many localities have been provided with improved sanitary conditions which has saved many lives; also thousands of dangerous structures on highways have been replaced, dangerous curves on highways have been eliminated, modern schools and other public buildings have been provided through WPA. Some of the best engineers and other trained men in our country have been provided employment and an opportunity to follow their profession and broaden their experience.

Waste? Sure there has been waste, but not so much that you would class it "Waste Passes Away". You must realize that there is waste in any undertaking regardless of how large or how small; you may find it in your organization.

Value received from WPA cannot be measured in dollars and cents, it must be measured by what it was intended for, to eliminate hunger and possibly revolt from the depressed people of our nation, and while eliminating hunger and distress, provided some of the things which are essential to better living conditions for all the people instead of a privileged few.

You speak of the sponsors or local governmental officials being opposed to the program. Yes this is true, but in many instances it was because they were unable to cash in politically or resented a part or all of the obligations that must meet to participate. They were free to discontinue at any time if they so wished.

It appears to me that your knowledge of functioning of WPA is limited, and you are basing your criticism on criticism from various sources. This criticism has been very strong the past few months because WPA was extended beyond the period of need.

You speak of lowering rather than raising self-respect. This may be true of some instances, but in a large per-

…tage you are wrong. You must …ember that WPA workers con…ed of the highest type and the low…t type workers, and with a few ex…tions they accepted private em…yment when available. I am in a …ition to know that there are a …ge number of workers now doing …portant defense jobs who received …ir training while employed on …PA.

I am a recent subscriber to the *…gineering News-Record*, and like …e publication very much. Continue …speak your thoughts in your edi…rials, but please be fair.

KENNETT MURDOCH
Hamden, Ohio

…PA was Realistic

Sir: It seems to me that the blanket …demnation of WPA in the editorial …the Dec. 17 issue is rather severe. …lief of some kind just had to be, no …atter what it was called. Bank fail…es by the hundreds, crop failures, …arving live stock, hungry and naked …eople of pride and still willing to …ork. Surely, we are grateful to a …overnment which tried to alleviate …some manner these conditions.

During the life of the WPA there …as also carried on a great PWA pro…ram, which, because of the use of …normous labor saving equipment, …iled to make much of a dent in the …bor surplus. Even now, with a 50 …illion construction program going …n, has it been able to absorb all the …bor in every locality?

Every WPA project had to have a …ublic sponsor and that sponsor had …right to insist, and should have, …hat the WPA projects be operated …fficiently and economically. Thou…ands of good engineers worked night …nd day trying to provide plans and …dministration for needed govern…ental projects, and millions of …orthwhile projects were completed. …s a matter of fact there were count…ss thousands of sewer, street, water…orks, highway and bridge projects …hich were badly needed by the com…unities, but absolutely could not be …inanced either by the abutting prop…rties or the taxing agency.

If we will look at the WPA in the …orrect way, we will realize that it …eturned double value. It provided …ood for millions, and millions of per…anent improvements. As an engi…eer who made plans and proposals …or hundreds of men and worked hundreds of men on WPA projects. I did not find any more loafers than you would find on any contract job. It was impossible for the WPA to take a man who never was any good on any job and make him over into a great worker, although many were taught new trades on WPA work. Any engineer can dream of projects and plans, but I want to tell you it took real ingenuity and a *real* engineer to design *worthwhile* projects, employing a large amount of unskilled labor and financed by a community short of money because people had no money to pay taxes with. Any blanket condemnation of the WPA is a blanket condemnation of thousands of engineers who worked terribly hard in a time of great need, and they should be commended.

This letter is not intended as a blanket recommendation of all WPA work and personnel, because in such an enormous task there is bound to show up a number of black marks and scars. Let us be big enough to look at the overall picture and give credit where it is due.

Let us be practical and not too theoretical in dealing with men begging for crumbs.

BEN C. DALE,
County Engineer,
Falls City, Nebr.

WPA and Henry George

Sir: In an editorial in your issue of Jan. 14 you say of WPA, "No nation on the threshold of planning a postwar world should begin by resigning itself to the inevitability of such a philosophy," but "what is the answer to unemployment relief we do not profess to know."

The Robert Schalkenbach Foundation, 32 East 29th St., New York City, has a library full of material ably dealing with that subject, carefully analyzed half a century ago by Henry George, and as live today as when he wrote it. In the Spring of 1933 an editorial in *Liberty* made the statement that if taxes were removed from industry (and shifted to the unearned increment of land-values) the depression would end in thirty days. Certainly relieving industry of (what was then) more than a ten-billion-dollar burden annually, would have gone far toward helping it re-establish itself. Instead of that, taxes on industry were pyramided and repyramided, and it took a world war to end the depression.

Your conclusion is amply justified, but something more is needed.

HARRY W. OLNEY
Director, National League of
Political Economy Clubs
Washington, D. C.

WPA Regenerated Engineers

Sir: As a *News-Record* reader of long standing, I do not think that your editorial of Dec. 17, 1942 in re WPA shows a very good idea among your staff of the value of that organization. True, there was waste, but the regeneration of thousands of engineers and construction men seems to have been overlooked. I am glad to observe your credit to General Somervell, who did an outstanding job as administrator for New York City. I was for some time assistant director of operations in New York City, and I know that I never worked harder on any private job than I did on WPA. My experience was confined to New York City and I cannot say how the rest of the country operated, but from what I have seen of how some of the defense industry is operated, WPA was not so poor in comparison. But the real point is that when commenting on how bad the WPA was in expense and alleged inefficiency, account should be taken of the regeneration of engineering professional men. In that respect the value of WPA was tremendous.

E. W. BOROUGH
New York, N. Y.

WPA Failed Its Purpose

Sir: I have read with interest the various statements, both old and new, concerning WPA, which have appeared recently including the letters by Mr. Fellows and Mr. Hallihan. The point which has been missed is the demonstrable fact that WPA was unproductive on the basis of the investment in WPA of man-days of labor and of dollars.

It is obvious that men must be fed. It is advisable that they work in order that they may feed themselves. It is wrong, however, to employ them in such a manner that two, three or four dollars worth of time and material are consumed in producing results valued at one dollar. The end to

such procedure will be clear to even the most childlike of adult minds. No amount of alleged gifts to cities, counties, states, etc., and no roll of honor, however long of achievement accomplished, can change the result. The country was impoverished, not enriched, by WPA. WPA consumed more than it produced. Unfortunately, it offered only a weak stimulus to the movement of the wheels of normal economic activity. Had it stimulated such activity in a healthy manner, the billions it used poorly might properly have been charged off to the account of pump priming.

All credit to those who attempted to make WPA operate and to those who gave it their support and constant work. It is to be regretted, however, if the country has not learned that the WPA system was fundamentally wrong.

ROBERT V. EDWARDS
Los Angeles, Calif.

WPA Needs A-E-M Setup

Dear Sirs: It is the considered opinion of all of the members of the private engineering firm with which the writer is engaged that WPA can be used efficiently and in a satisfying manner as a device to create and maintain subsistence-wage jobs, whenever there is need for such employment, provided there is introduced into every WPA project and maintained throughout the life of the project the necessary element of adequate engineering supervision. On many past WPA projects that came to our attention that element was present; in many others it was woefully lacking.

If there is to be a postwar WPA program, then officials of WPA should demand that the sponsors provide in every case adequate engineering services both during the period of design and during the construction stage as well. The engineering work during construction could be akin to the A-E-M services on recent army construction work. The WPA could now develop in anticipation of a postwar program an approved list of Architect-Engineer and Architect-Engineer-Manager firms who could be employed by the project sponsors. In some cases satisfactory Architect - Engineer organizations could be created out of the personnel of city, county and state engineering staffs, but if that is done, their work on WPA projects should engage their full time services.

WPA should in future maintain a control section to insure the continuing efficiency of the Architect-Engineer or Architect-Engineer-Manager services on all WPA projects. Political time-serving and inefficiency should be promptly eliminated from the Architect-Engineer-Manager set-ups whenever it is evident. That will demand non-political appointees in all important WPA administrative posts.

WPA should also in future discourage small projects that are not worthwhile from the economic standpoint, and should interest itself more in consolidating available WPA labor on larger and more valuable public works where good Architect-Engineer-Manager services can more easily be obtained. Such a policy will make it incumbent on the WPA and the Architect-Engineer-Manager to work out transportation and housing problems for the larger projects. The costs of transportation and/or housing should be included at the outset in the project costs.

A good Architect-Engineer-Manager on a future WPA Project will:

1. Insure a dollar's worth of work for a dollar's worth of pay.
2. Make proper use of construction equipment.
3. Confine hand labor methods to work where such labor at WPA labor rates is truly economical.
4. Utilize services of construction contractors and experienced construction superintendents where it is economical to do so with WPA labor.
5. Develop construction costs that will compare favorably with costs on similar work performed wholly by private contractors.
6. Turn out finished work of good design and high quality.
7. Maintain overhead expenses at proper levels.

WPA can be considered only a transitional necessity as far as able-bodied workers are concerned. For the older workers and those somewhat sub-standard physically, who are not able to produce at the high speed demanded by one scale high union wages, a permanent form of WPA or other government sponsored work will probably be required in the post-war era. The alternative under present industrial and construction rules is complete economic waste of the less efficient types of labor, and their maintenance by direct relief.

ARTHUR WARNER CONSOER
Consoer, Townsend & Quinlan
Chicago, Ill.

WPA Met a Need

Sir: You have published the views of those who have a stake in one side or the other of the WPA controversy. It seems fitting that you should have the views of a plain American citizen whose main efforts have been devoted to providing for and educating his children and acquiring a modest degree of security for his wife and himself through working as a construction engineer.

The voltage of materialistic selfishness was exceedingly high in the late twenties, and the amperage of humanitarianism was correspondingly low. The reverse was true in the thirties. However, the energy curve has maintained a consistent upward trend all through the ages. This analogy seems to apply to individuals as well as to peoples.

In the late twenties, step-up transformers were thrown into the energy line, which burned out the controls. In the thirties, the voltage was so low that the line losses just about consumed the output. Those dynamo-humanity engineers of the present day, who have attained prominence, are of two opposing schools. One advocates higher and higher voltage, and the other crusades for more and more amperage. Both ignore the limited capacity of human nature and intelligence as a conductor. The former has devoted very little time to designing high amperage machinery and the latter has practically disregarded the necessity for voltage.

During the thirties the high amperage engineers were in the saddle. It must be admitted however that those who designed the construction program of the WPA exercised more restraint than the high voltage engineers of the late twenties. Of all the alphabetical agencies which were established this program was the most all-around efficient dynamo-humanity machine. Such agencies as RFC, SEC, and NRA merely repaired the burned out controls. PWA had more voltage than the times warranted. Relief had no voltage at all.

As to the attitude of the construction industry toward a construction work-relief program, this industry must bear in mind that it is the one important activity that is best adapted to the nation wide employment of the skilled and unskilled workers. Generally speaking, in times of stress, the need for construction is distributed over the nation in proportion to unemployment. Need does not necessarily mean demand. The over-all wealth and prosperity of our country would be greatly enhanced if need became demand in many sections of the nation.

The construction industry, as we have it set up, is a very high voltage machine, too high to operate during times of stress and severe unemployment.

E. G. MINDER
Cranford, N. J.

WPA Developed Surveyors

Sir: In reading the editorial (*ENR*, Dec. 17, 1942), pertaining to the liquidation of WPA, I find myself being carried back twenty years to a period when it appeared obvious to members of other professions and individuals in business and industry that the engineers were not graced with the broader concept of living or the importance of public relations. In that period, the typical engineer faced the world in his field boots and other appropriate array, clutching an agreement which was the result of the sale of an idea by some far-seeing business man to some public officials or to a private concern. That typical engineer was followed by other members of the profession in similar garb, some with transits on their shoulders and others as assistants and helpers of long experience in the same job. Then came the construction engineer in possession of the low-bid contract, apparently acting somewhat out of character, but justified in this because he had the knowledge and equipment to create from the blue prints a structure which later would be held in the minds of the public as a monument to the local administration under whose regime the structure was erected. Invariably, even this engineer was given little credit for his contribution to society except, by the members of his profession. The nature of the little credit or praise he did get was in many instances dependent upon the extent of his profits.

Many present day engineers now are of the opinion that such a period in our profession has undergone a change, characterized by what took place in our transportation systems, which by advancing from the horse and buggy to the four-motored transport has succeeded in reducing world-wide distances to the equivalent of county or state-wide travel. It is my belief that the Work Projects Administration program is another evidence of that change, a possibility in progress your editorial seemed to have missed.

It has been my personal opinion that the *Engineering News-Record* desired to reflect the attitude and opinions of engineers and the engineering contractors, and that it desired to maintain leadership in the profession by disseminating accurate information pertaining to modern methods and procedures for the general advancement of those concerned. Therefore, it was with a great deal of astonishment, when reading your editorial, that I found a seemingly antiquated concept of the WPA program.

Perhaps the *Engineering News-Record* should make a further survey of the engineers, contractors, and those in the business of supplying engineering or construction equipment and materials in order to determine how many at sometime have maintained their self-respect by participating in a WPA project as an employee or otherwise. I feel sure that the data on such a survey would prove most interesting as a sequel to your editorial.

Public work, such as has been carried on under the "Waste Passes Away" program, has included various activities which did not appear to result in degrading engineering to the point of destroying its manpower and abilities. Although such work did not directly concern the "art of construction" it did affect engineers and surveyors. I refer to the engineering survey and mapping program. Although this part of the WPA activities was under my direction, I discuss it here because of my intimate knowledge of the work and its value rather than because it affords an opportunity for the justification of my services to the federal government. Furthermore, I am glad to discuss its merits here because of the benefits to the thousands of other individuals and engineers who seem to have gained far more than their self-respect. From all appearances and from my professional estimate of the results and costs, the work they accomplished does not seem to have been "fostered in a spirit of loafing".

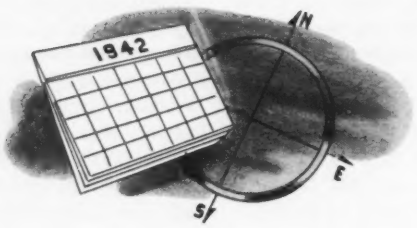
There are hundreds of localities in which surveys of a high order of accuracy have been executed at unit costs comparable to those prosecuted under any other type of program. I feel sure that the sponsors, who were not employed by WPA, would be pleased to inform you on this point, and would also welcome the opportunity of registering their opinions of your statement, "WPA made a travesty of the inspiring definition of the engineer".

According to your editorial, "WPA contained no kernel of permanent cure for unemployment. It just turned a sickness into a chronic disease". At the beginning of this program, I was somewhat amazed at the comparative small number of surveyors and engineers who were familiar with the execution and use of basic control surveys and the specifications for up-to-date mapping. Work Projects Administration has gone a long way in changing this. Although the need for such surveys and maps was generally recognized, the competent personnel to direct and supervise such projects were not available. Because of this situation, it was found necessary to train leaders and assistants on these projects in order to provide the needed manpower for accomplishing the desired amount of work, which in the meantime had further increased until it was far beyond the scope of normal demands.

If only for record purposes, it would be worthwhile for you to gain if possible some idea of the number of engineers, surveyors, contractors, those concerned with related engineering operations, and other individuals who do not concur in your opinions of the success of WPA. It is upon these persons who have been given an opportunity to gain their self-respect, to practice their profession, and to acquire further knowledge of their skills that much will depend in the post-war period. It will be their task to facilitate whatever type of program may be devised in this direction to serve future unemployment needs.

MURRAY Y. POLING
Director, Engineering Surveys Section
Works Projects Administration

Engineering News Events of 1942



JANUARY

CORPS OF ENGINEERS starts consolidating its field offices with those of the Construction Division of Quartermaster Corps. (*p. 1*)

CONGRESS authorizes $700,000,000 for expansion of naval and private shipyard building (*p. 1*)

GENERAL ELECTRIC starts work on $8,000,000 turbo-supercharger plant, (*p. 3*)

FIRST shield set up for Brooklyn-Battery Tunnel (*p. 4*)

CONGRESS includes $59,000,000 in supplemental appropriation for airport building program. (*p. 5*)

ENR FIGURES show 1941-42 biggest in construction history — $11,396,000,000 — 47% over 1928 (*p. 55*)

PRESIDENT's budget message outlines cut of 1/3 in non-defense public works (*p. 60*)

FWA PUTS prefabricated house program in mass production—Rufe B. Newman, Jr. placed in charge of program (*p. 73*)

TVA DEDICATES Cherokee Dam (*p. 74*)

START construction of 130-mile water line to Key West (*p. 77*)

BILLION dollar army camp construction program forecast (*p. 147*)

MUD MOUNTAIN DAM, in Washington, reaches height of 425 ft.—record for earth and rockfill (*p. 166*)

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URGE survey of building safety for air-raid safety zones (*p. 218*)

FIRST power released at Santee-Cooper (*p. 219*)

CORPS OF ENGINEERS inserts war damage clause in all contracts, absolving contractors from results of enemy action. (*p. 233*)

PANAMA cross-isthmus highway cut through. (*p. 235*)

A-E-M CONTRACT becomes standard for War Department (*p. 297*)

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LINER NORMANDIE capsizes at pier (*p. 309*)

NATIONAL HOUSING AGENCY created to consolidate house-building and financing activities. J. B. Blandford Jr. is administrator, (*p. 313*)

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FWA ATTEMPTS to decentralize activities (*p. 365*)

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ARMY rushes work on alien camps (*p. 460*)

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WPB ESTIMATES $15,000,000 construction volume for 1942. (*p. 595*)

SHORTAGE of trained technical personnel seen as war bottleneck (*p. 598*)

PULLMAN CO. reveals pendulum suspension cars (*p. 739*)

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JAPANESE evacuees to be settled on unused land of reclamation projects (*p. 761*)

CORPS OF ENGINEERS sets up new Mountain Division headquarters in Denver (*p. 815*)

ARMY engineers get first Alcan Highway equipment to site, beating thaw (*p. 820*)

LYTLE, GREEN given initial Alcan highway contract (*p. 821*)

ARMY-NAVY Munitions Board outlines substitute materials (*p. 824*)

WAR CONSTRUCTION seen ebbing as schedules are met (*p. 831*)

CONSTRUCTION WAGE rates on government projects frozen at July 1, 1942, levels (*p. 879*)

SPECIAL committee suggests controlled pumping to salvage Normandie (*p. 880*)

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RECLAMATION BUREAU starts work on Davis Dam on Colorado River. (*p. 960*)

HARTFORD BRIDGE erection under way again after wreckage of first attempt is cleared away (*p. 966*)

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KAISER SHIPYARD launches 10,500 ton freighter in 10 days (*p. 451*)

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GEORGE S. DAVISON, past president, Am.Soc. C.E., dies at 86 (*p. 525*)

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WPB DRAFTS recommendations for steel use in mill building types—puts limit on sizes of reinforcing bars (*p. 599*)

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CONSTRUCTION industry placed under price regulation (*p. 613*)

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SELECTIVE SERVICE lists essential occupations (*p. 667*)

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MAJOR WPB ORDERS AFFECTING CONSTRUCTION

First materials scarcity list (*Mar. 19, p. 447*)

Order L-41, curtailing all construction (*April 16, p. 577*)

Construction machinery purchases on an A-1 priority basis (*April 16, p. 581*)

Stabilization of construction wages (*April 16, p. 583*)

Steel limitation order (*May 7, p. 759*)

Construction equipment sale and rental subject to strict control, OPA issues ceiling rates (*May 7, p. 760*)

Retail sale of lumber frozen for 60-day period (*May 21, p. 836*)

Code system installed as check on final use of raw materials (*June 4, p. 895*)

New plant construction held to essential war needs, simple designs (*June 4, p. 896*)

"Sound one side," new plywood grade introduced. (*July 9, p. 63*)

Precedence given water supply, power, roads and sewerage, in that order (*July 16, p. 73*)

Cement manufacture limited to three basic types (*Aug. 13, p. 203*)

Power expansion program cut from 9,600,000 kw to about 4,500,000 (*Aug. 27, p. 271*)

Unit stress of 24,000 lb for steel design for buildings for gov't agencies. Asks widest use of welding, continuity (*Sept. 17, p. 389*)

Specifications for design of reinforced concrete buildings, stepping up permitted stresses on reinforcement (*Oct. 8, p. 463*)

Power, irrigation, road projects halted in general building cut to bring construction into line with war needs. (*Nov. 5, p. 618*)

War construction program cut, halting $45,000,000 ordnance plant, among others. (*Dec. 3, p. 755*)

News-Record Staff Arti

Construction job of the year was the Alcan Highway, which the Corps of Engineer the PRA and its contractors pushed 1,670 miles through the Northwest wilderne including crossings of glacier debris fans as pictured here, in less than five mont

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EVIEW AND FORECAST—1942-1943

AMERICA'S FIRST YEAR OF WAR was its greatest year of construction. Born of the anger and determination that flared from the smouldering ruins of Pearl Harbor, Hickam Field and Cavite, and spurred by the loss of engineers, construction men and their handiwork at Wake and Guam, was an implacable will for accomplishment that produced results unequalled in construction history.

Ten days after Pearl Harbor it was written in these pages: "Building for defense is a thing of the past. The construction industry's new standards must be emblazoned 'building for battle.' There is a great difference. Time was short. Now there is no more time. If a bomber plant was built in six months, it must now be built in three. If a dam or a drydock was completed in the record time of twelve months, half that period must be the goal for the next ones."

Puny words of hope when they were written, they now mirror a challenge that not only was met but surpassed. War plants *were* built in three months and drydocks in six. Moreover, ships were constructed in a week, and usable airfields, in the Solomons and Africa, in ten days.

Thanks to engineers who burned midnight oil by the barrel, to contractors' superintendents and foremen who toiled the clock around, and to the construction workers who loyally stuck to their jobs to keep strike-lost days to an all-time low, the record of 1942 is a glorious page in construction history. In 1942 the facilities were provided to assure a victory-studded war offensive in 1943.

hat Was Accomplished

PLACE 1942 construction in proper perspective, is useful to review the growth of construction lume since the war began. In 1939 it totaled billion dollars, rising to 8½ billions in 1940 d to 11⅓ billions in 1941, to top all previous cords such as the 10½ billions of 1928 and the ⅓ billions of 1929. As 1942 began, there was ason to believe that the upward trend would not ntinue. While war construction would certainly crease, civilian construction, which had accounted r 35 percent of the 1941 volume, was due for bstantial curtailment. The net result was a 10 llion dollar estimate for 1942.

It proved too low by nearly one-third. For while e pattern of decreasing civilian work was corctly foreseen, neither the growth in war construcon nor the speed with which it could be carried t was properly evaluated. The year ended with early 13 billions being spent on construction in e United States, to which at least 2 billions can be lded for construction outside the country, by merican men using American machines and materials. Thus, total construction volume of 1942 as in the neighborhood of 15 billion dollars, a sum that was nearly as much as was spent in all of the five depression years following 1931, and was considerably more than the total of the two prewar years of 1938 and 1939.

Difficulties Melt Away

ATTAINMENT of such a huge volume of construction in twelve months was not without its difficulties. Materials scarcities developed, new equipment became unavailable, labor turnover was often exasperating, and compliance with the orders and requirements of the War Production Board and the Office of Price Administration kept things in a constant turmoil. But despite these problems, and the grousing they generated, construction hummed as it never had before. And it hummed because this was the kind of construction job that engineers and contractors revel in—a demand for results in big quantities and quick.

The fact that many familiar materials were not available was merely a challenge to designers' abilities. Likewise, the necessity for locating secondhand equipment and getting new-equipment results out of it was only another opportunity to exercise latent ingenuity. Even the controls, necessarily im-

posed by WPB and OPA, were taken pretty much in stride. All these were tangible problems that could be whipped by hard work and good management. This was the exciting, worthwhile kind of job we had been waiting for. Under that spirit, what difficulties there were melted away.

Mashalling Our Assets

PROBLEMS DID NOT VANISH by wishing, however. One of these problems was to marshal the assets of small as well as large engineering and construction firms to the task at hand. Consolidation of all army construction into the hands of the Corps of Engineers, and the subsequent decentralization of activities, including contract letting, among the divisions and districts, was an initial step in the right direction. It cut the job down to regional size. Next, negotiation was substituted for competitive bidding, to furnish a device for putting work directly into willing and capable hands. And, finally, a new type of contract was devised, which required engineers and contractors to team up on a job, get some of it going with their own forces, and then design and sublet chunks of the remainder to small firms. This architect-engineer-manager type of contract got off to a slow start because, at first, it contemplated leaving the field managerial function to the architect-engineer. But this error was soon corrected, and when a construction firm was added the arrangement worked efficiently.

The A-E-M contract was one of the important developments of the year. By bringing design and construction talent to bear on a job from the very beginning, it produced results that had previously been exasperatingly elusive.

Materials and Equipment

GETTING THE JOB UNDERWAY quickly and effectively, however, merely speeded collision with other problems, principally those of materials and equipment, and to some extent of labor rates. An article on p. 194 reviews these problems in detail, but a few of the essentials are worth emphasis here. Shortage of structural steel for construction forced a shift to reinforced concrete and then to plain concrete and timber. New and interesting designs were developed in both of these latter materials, designs which, in some cases, may be competitive with anything the postwar world may offer.

Careful thought also was given to economy of structural steel designs, and an important contribution in this direction was made by WPB's Specifications Branch in the form of a comparative study of different types of steel factory framing. This same WPB branch developed and issued new design specifications for structural steel and reinforced concrete incorporating raised unit stresses. Unfortunately for their prime objective of saving steel, they were not made effective until most of the steel had already been saved by changing designs to timber. So extensive, in fact, was the shift that timber itself was soon high up on the critical list.

None of these materials was obtainable without priorities, which created another problem that was troublesome, without being too serious. Restrictions on new equipment, on the other hand, proved more difficult, probably because they were unprecedented and because military requisitioning of eighty percent of the output was unexpected. Throwing the industry onto a used-equipment basis required a knowledge of what was available, and false starts and procrastination on the part of WPB in undertaking a nation-wide inventory left things in an unsettled state for most of the year. The inventory that WPB finally completed, however, was a good one, so that the situation is now much improved.

War Public Works

SHORTAGES of materials and equipment were felt particularly in the field of essential public works, such as water-supply, sewageworks and roads and streets for communities that had grown into boom towns. It was not until the Federal Works Agency developed into a champion for city's rights in the "hall of priorities" that progress began to be made. FWA was also useful in standardizing buildings for the war public works program, and as the year ended was handling all war public works as a strictly federal job from regional offices. In the meantime, WPB had recognized the importance of these facilities by issuing a preference list on which water supply, power, fire equipment, sewageworks and access roads appeared in that order.

Housing Mobilized for War

NOT ON THIS LIST was housing, but its absence only emphasized that it was in a class by itself—both as to importance and as to mishandling. When the sixteen federal agencies that had been concerned with housing were replaced by the National Housing Agency last February, some semblance of order began to emerge. But while this cleared the track of many administrative hurdles, war housing still struggled in the bog of materials shortages.

Designs were simplified to eliminate metals, but the real trouble developed when lumber itself became a scarce material. Further delays arose from the necessity of having projects approved first by

HA and then by WPB. Finally a plan was evolved hereby WPB allocates definite quantities of aterial to NHA, which distributes it as it will. Public housing units built in 1942 totaled 128,-0, and there were 214,000 under construction; ans have been made to start another 170,000 its in the next six months. Private house builders, der NHA jurisdiction, completed 195,000 units, d had about 80,000 under construction; during e coming year it is expected that privately anced houses will total 170,000. Compared with 941, last year saw a drop of 34 percent in new mily units started. Prefabrication, both on-site d off-site, received enthusiastic acceptance in any places. The lessons being learned in mass oduction of "engineered housing" (a term pre-rred to prefabrication), particularly in the use single-wall materials, hold rich promise for e postwar period. What the market will be is dicated by one survey showing that 900,000 milies intend to build homes after the war.

Changing Emphasis

S THE YEAR PROGRESSED, engineers and construc-on men found their jobs, their responsibilities and eir opportunities changing under the impact of evelopments on the battlefronts. The great rush to uild defensive bases in the Caribbean slowed down s the war turned eastward instead of westward. ar factory construction likewise was curtailed, as e efficiency of the new factories proved greater an expected. But working simultaneously with ese constraining forces was the influence of our xpanding global offensive into theaters-of-opera-on where construction by troops instead of civil-ns was mandatory.

Most significant resulting development was or-anization of Navy Construction Battalions, the Sea-ees, to build and maintain naval establishments broad. Over 100,000 construction men entered his field of national service in 1942, and that many ore are scheduled to follow in 1943. Coincident ith this Navy expansion was growth of the Army orps of Engineers to a size that will far exceed e 200,000 figure of the last world war, and will ncompass air-borne and amphibious as well as and contingents.

On the home front, construction men found them-elves in the shipbuilding business, and turned in performance as noted on p. 200, that may well evolutionize this special field of construction for any years to come. Change in emphasis brought n by war developments was also seen in the down-wing that followed the upsurge of interest in air raid protection and civilian defense; and in the fading out and final abandonment of WPA.

Postwar Public Works

STILL ANOTHER CHANGE engendered by shifts in the fortunes of war was a rising interest in postwar public works planning, a subject that was pushed to the back of the shelf soon after Pearl Harbor. A joint undertaking of the FWA and the National Resources Planning Board to interest local governments in setting up six-year programs met with some success, about fifty communities adopting the plan, but few actual designs resulted. Similar slowness characterized PRA's attempt to get state highway departments to design postwar urban road projects, even though $10,000,000 of federal aid was available on a matching basis. In contrast to these early negative developments, which were a natural result of our preoccupation with a war that was going against us, was New York City's action in August of appropriating $10,000,000 for immediate postwar designing work. In recent weeks, too, Congress has seemed receptive to reconsideration of federal aid to local governments on designs. As a consequence, and with the war going more favorably, postwar public works planning can readily develop considerable stature before another year is passed.

Moving Toward the Payoff

IN THE YEAR AHEAD the changes in emphasis that characterized 1942 seem sure to accelerate. In the United States, to use a military term, construction will consolidate its position, a process that will involve maintaining what it has built, providing replacements or expansions where needed, and filling in some of the chinks in the armor of the arsenal of democracy, such as building plants to produce aviation gasoline and synthetic rubber, laying pipelines, stepping up escort vessel production and opening up mining properties.

Outside the continental limits of the country, the use of American construction men, materials and machines will expand to unprecedented dimensions, as the war offensive brings more and more territory under control. This is the year of the payoff in military victories for the construction job of 1942, and engineers and construction men are going to play a prominent part in the collection process.

And while these activities are rife on foreign shores, there will be a job to be done at home, keeping community facilities and transportation functioning and, most important of all, laying the groundwork for postwar construction. Beyond 1943 lies victory and the responsibilities of peace.

Buildings of 1942 Were for War

In the face of priorities and restriction on non-war work, building construction reached an all-time high. Substitutions, including concrete and timber for steel, produced many uncommon structures

A. N. Carter

IN SPITE OF RESTRICTIONS on certain types of work, that classed as "building construction" exceeded in 1942 the 1941 record all-time total by 37 percent. Almost entirely for war purposes, it accounted for two-thirds of all engineered construction and reached the staggering total of $6,170,000,000. Three major types of building construction were predominate: (1) privately and publicly financed industrial buildings, which accounted for two and one-half billion dollars; (2) housing, including that at military camps, which totaled over one and one-half billion dollars; and (3) military construction other than housing, which aggregated two billion dollars.

Scope of this huge program is illustrated by the fact that the total of industrial building construction was 20 percent more than in 1941, housing 55 percent greater, and military building construction other than housing five times as large. Further proof that the United States built for war is that building construction classified as private commercial work, for example office structures, and federally financed peace-time projects such as post offices, totaled but 28 percent of what it did in 1941. Since the huge program of 1942 was only possible by using a restricted list of materials and by placing emphasis on speed, many changes in building construction resulted.

Major change in army housing was the changeover to the theater-of-operations type of construction, which required that the structures be built with a minimum of materials but by methods common to the past. The same was true of mass housing, although here an added point of interest rests in extensive use of prefabrication. Since developments in such structures were not outstanding, this review will be confined to industrial plants, military buildings other than housing, and a few important commercial structures.

Concrete used extensively

Industrial plants continued to break all records for size, but the greatest 1942 change for such buildings was the use of concrete and timber where steel might have been used in the past. Foundations of unreinforced concrete were common, in some cases requiring massive footings. In one war plant the tradition of placing footings under building walls and columns and pouring the floor separately was forgotten, the plain concrete floor slab merely being thickened at the wall and column supports and placed on a raised compacted base of clay and crushed stone. Building sizes in this project varied from 33x45-ft. storage houses to 50x500-ft. manufacturing buildings, and no expansion joints were used, regardless of the size of the floor slab. Edges of the slab under heavy walls were thickened to 11 in. and under trucking aprons to 8 in.

White cement for floors

Plain concrete slabs for the ground floor were common, but the most spectacular advance in floor design was the use of white cement for the surface of floors of a bomber assembly plant and a number of other aircraft factories. In the bomber plant, some 700,000 sq. ft. of floor was topped with a $\frac{3}{8}$-in. surface of a 1:2½ mortar of white cement and white silica sand and placed monolithic with the structural slab. The surfacing, which proved very effective in improving the lighting on the underside of the aircraft being assembled, was added before the base course had taken its final set, but after it had hardened sufficiently to permit walking on it without leaving marks.

Several schemes were used to save steel in constructing floors not resting on the ground. For a project at Los Angeles precast concrete joists reinforced with cold-drawn wire proved very economical. In combination with a concrete slab reinforced with wire fabric instead of bars, total steel requirements for the floor, for spans of 12 to 14 ft., were reduced by two-thirds or to less than 1 lb. per sq. ft. of floor.

On a U. S. Engineer project in the Midwest, non-reinforced drop panels were employed in constructing a heavy manufacturing floor on reinforced concrete columns on 20-ft. centers each way. The flat-slab floor was 12 to 18 in. thick and with four-way reinforcing, but without bars in the 9-ft. square drop panels, which increased the floor thickness to as much as 22 in. at the columns.

Emergency steel specifications

A national emergency specification put into effect Sept. 10 by the War Production Board, made mandatory an increase in the basic unit steel stress for steel building construction from 20,000 to 24,000 psi. This order made possible some saving of steel in designing the framework of industrial buildings, but it had only minor effect, due to the scarcity of steel at that time.

Huge one-story industrial buildings built of reinforced concrete were common. One such plant, which received major attention, was an eastern factory that got to be known as "war speed." Not only was this structure which had a 20x38-ft. column spacing and a beam and flat slab roof, rapidly constructed, but a comparison with several other types showed the adopted design to be most economi

Designs studied included: (1) od truss with plank roof; (2) struc- al steel; (3) reinforced concrete th beam and girder construction; d (4) the "warspeed" beam and t slab. These studies indicated that latter design would cost 40c. per ft. of floor space less than the eapest of the other types.

Another type of reinforced-con- ete construction that continued to d favor was the multiple-arch roof. ne of the notable applications of this sign was on the Dodge engine plant, id to be the largest plant in the na- n. The framing for this plant is aracterized by a multiple, thin- ction arch slab spanning 38 ft. be- ween concrete girders supported by ncrete columns every 30 ft. Cover- g 80 acres, this large building re- uired but 2.7 lb. of steel per sq.ft. of oor space, whereas the original de- gn in structural steel was 12.7 lb. r sq.ft.

Concrete frames entirely of pre-cast concrete also made their appearance (see p. 230 of this issue). This framing was used for several buildings in the Pittsburgh, Pa., area.

Timber also plays a big part

Timber was used alone or in combination with concrete to great advantage. In some cases the columns were of reinforced-concrete and the roof framing of timber; in other structures the columns also were timber. Trusses with parallel top and bottom chords of solid timber were used extensively, but laminated timber construction also found great favor.

This latter construction appeared in many ways. For a Wisconsin machine shop laminated timber beams of 67-ft. span, 15-in. width, and 35-in. maximum depth were used for the roof framing. They were fabricated of $\frac{1}{16}$-in. thick material with casein glue, and the beams not only saved large quantities of steel but also permitted construction to start immediately.

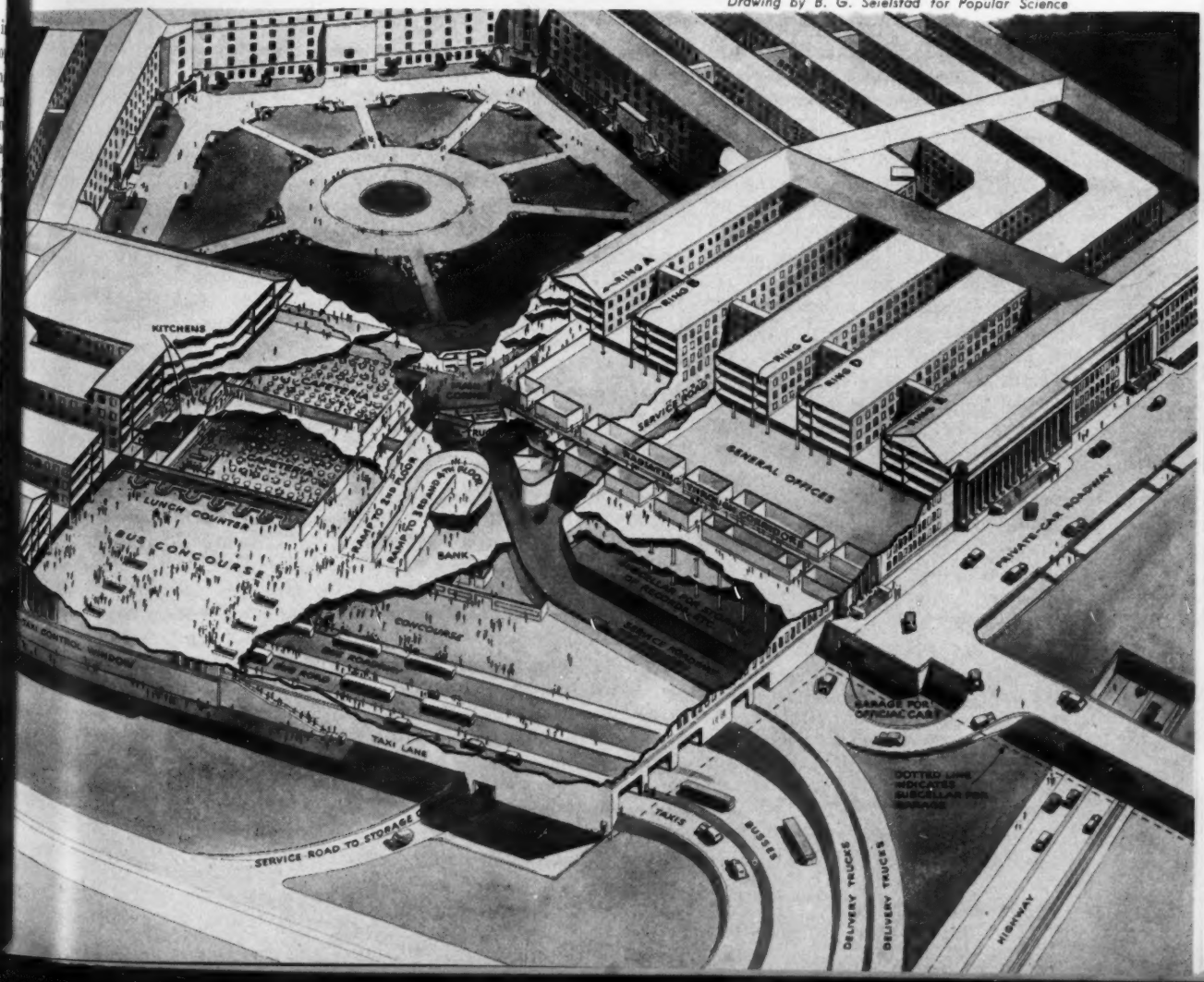
Another use of laminated timbers was in the upper chords of bowstring trusses, for example, the 160-ft. bowstrings used for an airplane hangar in an eastern city. Supported on buttressed concrete columns, the trusses have upper chords made of two stacks of nine 2x6-in. timbers bent to a radius of 170 ft. and spiked and glued together. The lower chords are two 6x12-in. pieces and the web members 6x6-in. pieces.

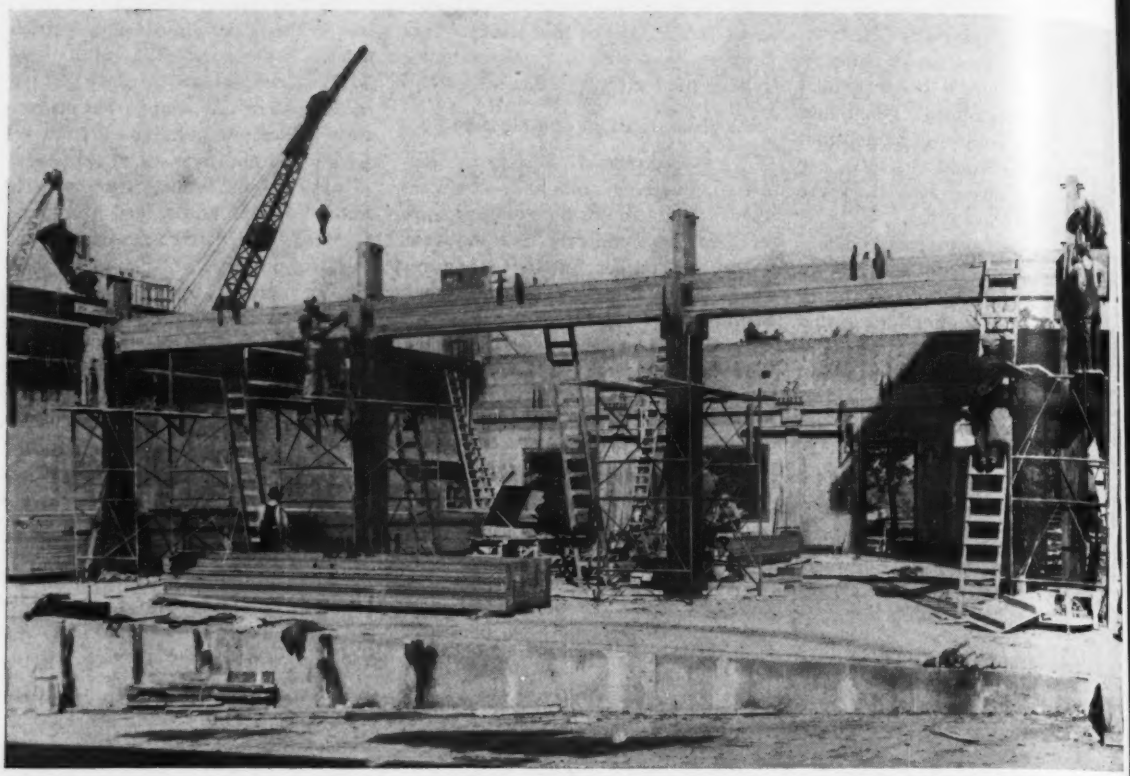
Laminated arches popular

Still another trend in laminated construction was the extensive use of laminated timber arches. For testing building in Kentucky for the Signal Corps, glued laminated arches of 54-ft. span and 66-ft. rise were employed. Located on 16-ft. centers, the members were fabricated from $\frac{3}{16}$-in. thick southern yellow pine held together by casein glue. Each arch is $7\frac{1}{2}$ in. wide and 2 ft. deep. Many other glued arch designs were used for air-

...housing 40,000 workers, the War Department's Pentagon Building is the world's largest office structure. It also is uncom- ...on because of its shape, concentric office rings, and ramps for pedestrian travel from floor to floor.

Drawing by B. G. Seielstad for Popular Science





Concrete and timber in 1942 were used for many buildings that in the past would have been built with steel frames. For this one-story plant the exterior walls and columns are of reinforced-concrete and the roof framing consists of laminated timber beams fabricated from 1x8-in. yellow pine material.

plane hangars, drill halls, and other one-story structures.

Plywood girders of at least two kinds appeared during 1942. One type was the 36-ft. span, double-web members used for a Camden, N. J., plant built by the RCA Manufacturing Co. In fabricating these members $\frac{5}{8}$-in. plywood sheets were added on each face of laminated chords of 2x6-in. planks and vertical stiffeners varying in size from 6x10's to 2x6's.

In the Detroit area plywood girders with a single web of plywood and top and bottom flanges of dimensional lumber were used for a great many industrial plants. One of the largest girders of this type was of 60-ft. span and 60-in. depth, designed to carry a load of 1,200 lb. per lin.ft. These girders have a $1\frac{1}{2}$-in. thick plywood web, and each flange is eight 2x8-in. timbers, four either side of the web. To reduce steel to an absolute minimum the fabricators used $1\frac{1}{8}$-in. dia. maple dowels instead of bolts.

Rigid timber frames used

For small structures on the Pacific Coast rigid timber frames constructed with plywood gusset plates and fabricated with split ring connectors were employed to advantage. For spans of 40 ft., this design required 50 percent less lumber than timber trusses with parallel top and bottom chords. Other savings in industrial buildings were brought about by the use of timber purlins and columns.

Wood sash and glass block find favor

During the year many schemes were considered to permit blackout of war plants, and a number of windowless structures were built, but for the most part normal-daylighted buildings were used. The most notable changes in regard to wall construction for industrial and war buildings were: (1) Use of ordinary wood-frame windows instead of metal sash; (2) a wood sash for industrial buildings developed by a member of the Albert Kahn firm and for which all patent rights were waived; and (3) development of a special glass block and extensive use of this material. The new wood sash has a ventilator similar to that for steel sash and each 4-ft. wide unit is made up complete at the mill.

Known as directional light units, the new glass block has a built-in prism that deflects the incoming daylight upward to the ceiling, which directs the light downward onto the working area. As a result, not only is the daylighting received from above, but daylighting much farther from the exterior walls results.

On a plant built by the Bell Aircraft Co. a patented combination screen and shade was employed for the south and west windows. The shade has $\frac{1}{4}$-in. wide horizontal slats about $\frac{1}{8}$ in. apart in place of conventional wire screen. The slats are turned at a fixed angle, and, although admitting much light, are said to prevent glare from affecting workers near the windows.

Although not new, a noticeable trend in wall construction was the use of walls of reinforced-concrete. This type of wall permitted rapid construction where a reinforced-concrete frame was being used, and in some localities was employed extensively.

Hangars with collapsible doors

Because of the type of door used, aircraft hangars at Garner Field, Uvalde, Texas, are of special interest.

The steel-frame door is covered on the exterior face with 30-in. wide longitudinal metal sheets. When opened, it collapses in a vertical plane into a 5½-ft. deep, 20-in. wide trench with its top flush with the hangar floor. This arrangement permits a 90-ft. high by 100-ft. wide opening at the end of the 100 x 200-ft. hangar.

Another outstanding design of the year is that for large timber-frame, clear-span hangars developed by the Navy. These structures require timber arches of 246-ft. span, which is considerably in excess of the longest previous timber arch span of 200-ft. used for the 1939 San Francisco exposition.

The arches have a rise of 140 ft. Set on 20-ft. centers, they are 9 ft. deep at the base and 13.64 ft. at the crown and are fabricated with bolts and split ring connectors. A 1,058 x 297-ft. hangar requires a total of 3,000,000 b.ft. of timber, including 750,000 b.ft. for the arches.

Outstanding office buildings

Large office buildings erected during 1942 were few and far between. However, they included one of the year's outstanding structures, the War Department's Pentagon Building, constructed in a little over a year to house 40,000 office workers. Not only is the Pentagon Building the world's largest office structure, but it also is uncommon in being five-sided with a 6-acre interior court around which the wings are arranged in concentric rings. Most notable characteristic is its provision for pedestrian travel from floor to floor by means of ramps.

Among the other structures completed during the year and worthy of mention are the Northwestern Technological Institute building, the Detroit Engineering Society building, and the Bell Telephone laboratories at Murray Hill, N. J.

Priorities affect interior work

Not only did restrictions on the use of critical materials affect the design of the framework and enclosure of office buildings, but they also governed the finishing of the structures and installation of air conditioning and service facilities. For example, the shortage of sheet metal for making air-conditioning ducts was overcome in constructing one of the buildings by the use of asbestos-cement tubing. In all, over 30 important substitutions were made on one project to save critical materials. They are listed in an accompanying table.

In conclusion it should be stated that many of the developments described were to overcome the shortage of certain critical materials and will not be employed after the war. However, many advancements, including new uses of old materials, were made in 1942 in building construction, and they should continue to play an important part in the future. All in all, not only because of its large volume of work, but also because of the many varied structures required, 1942 will be remembered as a remarkable year in building construction.

SUBSTITUTIONS TO SAVE CRITICAL BUILDING MATERIALS

Item Used	Item Ordinarily Used
Wood or slate baseboard	Metal baseboard
Wood interior doors	Metal doors
Tile partitions	Steel studs and wainscoting
Wood exterior doors	Bronze doors
Wrought iron or steel hardware with brass and bronze working parts	Bronze or brass hardware
Wood exterior light poles	Steel poles
Lead and later plastic flashing	Copper flashing
Black iron gutters and downspouts coated with asphaltic surfacing	Copper sheeting
Wood shelves, cabinets, and lockers	Metal construction
Urea-plastic on wood for cafeteria tables	Stainless steel
Wood overhead sliding doors	Rolling steel shutters
Wood hand rails in stairs	Metal rails
Kalamine doors for vaults	Steel doors
Wooden tray slides in cafeteria	Monel metal tubing
Lithopone, casein, oil-emulsion and resin-emulsion paints for interior finish	Lead-zinc base paints
Polished steel and galvanized iron for kitchen counters and fixtures	Stainless steel
Treated wood suspension system in refrigeration units	Metal T-bars
Wood doors for toilet stalls and structural glass sidewalls	Metal stalls and doors
Hardwood toilet seats	Hard rubber or plastic
Wood rails on brick parapet	Metal railing, iron grilles
Enameled metal mirror frames	Chrome-metal mirror frames
Galvanized water pipe where exposed	Copper pipe
Polished steel for light fixtures	Chromium-plated steel
Painted metal plumbing fittings (except faucets)	Chrome-plated brass
Asbestos-cement, air supply ducts	Steel or metal ducts
Black iron return air ducts	Galvanized iron
Wood access panels	Metal panels
Plastic plates over light switches	Metal plates
Steel coils for air-conditioning units	Copper coils
Terra cotta and concrete pipe	Cast iron or steel piping

Municipal Affairs and Sanitation Activities

Despite shortages of materials and manpower, engineers are meeting successfully the challenge of providing an unusual volume of water supply, sanitation and other facilities required by the war.

Edward J. Cleary

ACTIVITIES IN THE FIELD of municipal public works this past year can be appraised only in terms of adaptation to war conditions. Shortages of manpower, unusual population increases created by migration to war industries and severe limitations on the use of almost all construction materials created problems never before encountered in the United States.

Naturally, war production and the needs of the armed forces have had first call on materials and manpower. But it was recognized too, that the war machine could not function at highest efficiency unless essential public services were maintained. One problem to be faced, therefore, was to keep such services operating without interrupting vital production. Furthermore, the establishment of military camps and great industrial plants has called for installation of new sanitation works, expanded water supplies, roads and a host of facilities that fall in the classification of public works. This introduced further demands and complications. Volume of work undertaken in this category has been very great, but outside of strategic areas where it was concentrated, a large backlog of accumulated municipal needs is piling up.

Fig. 1. Civilian defense activity in Philadelphia. White paint is surfaced with glass beads for blackout traffic control.

To review municipal affairs and public works developments after one year of war, it may be helpful first to look at the general picture and then focus in turn on sewage treatment, water supply and refuse disposal practices.

Loss of personnel to the armed forces and by the lure of high wages in industrial plants has been one of the major concerns to administrators. Further complicating the personnel situation is the affiliation of public employees with labor unions. Cities have been negligent in their practice of employee-employer relationships, and now a long and stormy period of adjustment looms. Reasons advanced for labor union growth include: (1) public employees, like other citizens, have felt the impact of higher living costs, yet their wage levels are static; (2) they have been impressed by the growth of employee-union participation in private enterprise; and (3) they desire a means to remove the threat of job insecurity.

Federal confiscation of local authority appeared imminent last fall when a panel of the War Labor Board took temporary jurisdiction in a strike of garbage collectors in Newark, N. J. After the panel had made public its recommendations (asserting that it should have permanent jurisdiction and find against the rulings of the city) much clamor arose over the nation. Subsequently the WLB reversed the recommendation of the panel, deciding it should have no voice in the case.

Civilian defense activities

Civilian defense measures claimed much attention, as a result of which many new responsibilities were placed on public works engineers. Not the least of these was the development of emergency organizations and a plan of action to cope with conditions that might result from the bombing of water supply, sanitation and other facilities.

Another extra duty imposed by civilian defense was the inspection and designation of buildings for air-raid shelters and the installation of sandbag barricades at these buildings. West Coast cities took the lead in these activities but the East was not far behind. Baltimore, Md., for example, has 500 public air-raid shelters. Located in basements of public and private buildings, more than 4,000 sites were surveyed before selections were made.

When sandbag barricades came into vogue for important buildings in San Francisco, city authorities found that bags filled with a mixture of sand and asphalt produces a more durable barricade. Best results were obtained with 3 percent of 60-penetration paving asphalt mixed thoroughly in a pugmill with hot sand heated to 250 deg.

Still another example of what civilian defense means to cities is revealed by Philadelphia, Pa. experience in painting pavement strips to minimize

Fig. 2. A familiar sight in many cities was the removal of street-car rails as a contribution for the scrap salvage drive. To speed the job and minimize damage to pavements, ingenious home-made "rail pullers" were devised. The one pictured here operates with the aid of hydraulic jacks.

the hazards of traveling on streets during blackouts. Tests revealed that white or yellow pavement markings are of little value, and that only white paint containing glass beads gives sufficient indication under low intensity light conditions. As a result, some 500 miles of this type marking was installed.

Salvaging operations, designed primarily to accumulate scrap metal, was one of the most important tasks to which municipalities addressed themselves. Coupled with a house-to-house canvass for old metal was the removal of street car tracks, iron fences around parks and public buildings and the scrapping of metal structures such as old bridges. Since salvage value of iron rails is frequently less than the cost for removal, cities were reluctant to undertake this operation until the federal government agreed to subsidize the difference.

Sewage disposal developments

Quantitatively, the volume of work in the field of sewage disposal was most impressive, considering material shortages and other handicaps. Total expenditures of $125,000,000 were far beyond what was spent in any other year, except in the period 1938-1939 when all-time record-breaking totals of $136,000,000 and $150,000,000 were reached.

Aside from sewage disposal construction relating to military and housing needs, which have contributed the bulk of new work, sanitary engineers were confronted with the very special problem of providing treatment facilities for huge war production plants. To design facilities for these plants with their enormous concentrations of employees many "unknowns" had to be evaluated, such as those relating to volume and character of sewage produced, as well as variations in flow caused by "shift" operations and unusual plumbing arrangements. Some recent operating observations are extremely interesting as, for example, the data which reveal that in factories employing skilled labor the per capita flow is considerably less than in places where unskilled workers are engaged.

Because of the shortages of materials, it has been necessary to revise traditional methods of design. In general, savings in critical materials are being made by the use of unreinforced concrete, elimination of mechanical devices, substitution of wood for structural steel and the use of wooden sluice and shear gates. One of the most interesting innovations has been the use of plywood instead of metal for V-notch weirs around the periphery of large circular sedimentation tanks.

Some notable work is being done by the Army in the design of wooden Imhoff tanks (some of huge size) as well as in design of complete treatment plants, all structures of which are of wood.

Manufacturers, too, have given careful attention to the elimination of critical materials. For example, one company redesigned its sludge collector mechanisms so that wood could be used in place of some 62 percent of the steel formerly required.

One of the most unusual plants now in operation is the one serving the world's largest building — the new War Department office structure near Washington, D. C. Unique feature about this plant is the fact that it is designed to function at full capacity only 9 hr. daily. Based on 30 gal. per capita flow, the plant has a design rate of 3.2 mgd. To provide complete treatment for the sewage high-rate trickling filters were chosen.

Army camp experiences

Sewage disposal practice at army posts reflects experience gained in municipal work. Thus far the army has not found it desirable to standardize on any one type of treatment. Grease removal continues to be one of the big problems and special collector traps are now being installed in all mess halls.

The army has installed more than 25 contact aeration (Hays) process plants, but it is reported that few of these are designed alike and studies are being made to discover the best method for operating them. Until it was employed at army camps, the Hays process was not widely known; there are now 74 plants in twelve states. It consists essentially of preliminary sedimentation, successive stages of treatment by means of a submerged contact aeration and final clarification. A biologically active film attaches itself to asbestos-cement plates suspended in the aeration tanks and around which the sewage flows; air is bubbled through this tank continuously. (See *ENR* Jan. 28, 1943, p. 138.)

Efforts directed toward the conser-

Fig. 3. An innovation that holds promise for use in water and sewage treatment is a wood tank built with horizontal staves. Because the wood staves are placed horizontally instead of in the usual vertical position, the need for steel tension bands is eliminated in this 60-ft. dia., 9-ft. high structure built experimentally for oil storage. See ENR Nov. 5, 1942, p. 639.

vation of water supply at army camps have led to investigation of laundry water reclamation. Processing this waste water for re-use is expected to save about 10 gallons per day per man; reclaimed water will be used for washing laundry or equipment. The treatment process involves segregation of the laundry waste from other waste water, addition of a lime precipitant, flocculation with air and sedimentation. Equipment developed by the Pacific Flush Tank Co. and the Chicago Pump Co. is being used by the army.

Recent investigation of the possibility of sewage treatment by a flotation process in which chemical reagents are used to promote flotation, produced results that may justify further research.

Some 20 different reagents were tested at the University of North Carolina, but only one, DP-243 (heterpolar laurylamine hydrochloride) proved efficient for sewage flotation. Consistent values of 97 to almost 100 percent removal of suspended solids in bacteria indicate that on the basis of these criteria for efficiency of sewage treatment, flotation is superior to the usual process. However, from the viewpoint of removal of biochemical oxygen demand it is inferior to biological processes and yields results in the general range of those obtained by chemical precipitation, namely, 50 to 85 percent. Cost of the flotation agent at present is far too high to permit its practical application to sewage treatment, being in the neighborhood of $200 to $300 per million gallons treated.

In a treatment plant at San Diego, Calif., a new process known as the "vacuator" is being installed to remove grease, scum and oil. Developed by The Dorr Co., it is a vacuum flotation process applied prior to sedimentation. Sewage is aerated for a few minutes, after which it is subjected to a vacuum for a period of about 12 min. Fine bubbles, released by this action, attach themselves to the grease or scum-forming particles and causes them to rise to the surface where they are skimmed off. The process promises to have wide application for industrial waste treatment.

Water supply improvements

With water supply recognized as one of the country's most essential resources, it is understandable why improvements of such facilities and expansion totalled $156,000,000 — a value representing more than twice the volume of the two preceding years. Expansion would have been even greater had it been possible to grant allotments for all the materials requested.

Because so many materials needed in waterworks are on the critical list a serious situation has arisen in regard to even the most essential needs. As a result, the War Production Board ordered all waterworks utilities to reduce their inventories of supplies and equipment 40 percent below that which was carried in stock in 1940. Amounts above this figure must be offered for sale to other waterworks utilities. This directive has caused a host of complications because virtually all water utilities are operating far beyond their 1940 rate and therefore require on hand more materials than they did two years ago.

Several big projects were under way but perhaps the most spectacular of the war-inspired jobs is that now being completed in the Hampton Roads area of Virginia, where demands have increased by more than 300 percent. In order to develop new sources of supply as well as construct large treatment and distribution facilities, work that would normally require several years had to be telescoped into a few months' time. (*ENR* Oct. 8, 1942, p. 474.)

The largest treatment plant in the world—a 320 mgd. filtration project at Chicago, Ill.—was about half-completed in July when work was practically halted because of the scarcity of materials. (*ENR* June 18, 1942, p. 995.)

As is to be expected, little emphasis is being given to new developments not pertaining directly to the war effort. Things that were ready for announcement have been side-tracked for the duration because there is neither the material nor the opportunity to give them a trial.

Latest development in the softening field is the "Spiractor" process, the first municipal installation of which was made at Teutopolis, Ill. by the Permutit Co. of New York. Outstanding features of the Spiractor are its small size—since it provides only a 5- to 10-min. detention period of the water to be softened—and its production of a granular by-product instead of the usual voluminous wet and pasty lime sludge. The Spiractor process involves the principle of catalytic precipitation, the granules serving as a nuclei around which the precipitated compound of calcium and magnesium build up. (*ENR* Sept. 24, 1942, p. 442.)

Waterworks authorities have been unusually alert in preparing for emergencies created by bombing or sabotage. In this connection the American Water Works Association has sponsored successfully the development of what is known as the "mutual aid plan." As outlined by the association, this is a voluntary activity which works as follows: Under the leadership of a state sanitary engineer or state water coordinator, the public

ater utilities are drawn together into gional and state groups organized extend to each other emergency aid the form of material, equipment or rsonnel. The plan involves develop- ent of a detailed inventory of main- nance and repair material and uipment, and the assembly of these ventories on a state-wide basis.

Much discussion has centered on e possibility of poisoning water pplies by means of bacteria or hemicals. Poisoning reservoirs by broadcasting chemicals has been dis- ounted, however, in some quarters. Principal argument has been that the mount of chemicals required to do n effective job is prohibitive, one uthority pointing out that if it was esired to render water unfit for con- umption in a 100 mg. reservoir using a concentration of 100 ppm. of a oluble toxic substance, it would re- quire about 83,000 lb. of a chemical gent.

Refuse disposal developments

Nationwide emphasis on the sal- vage of metals, rubber and paper and a rapidly developing appreciation of the virtues of sanitary landfill dis- posal methods were, perhaps, of ma- jor interest in the field of refuse dis- posal.

Aside from participation in special collection campaigns to garner sal- vageable items from householders, municipal authorities are now en- gaged in a systematic collection of tin cans. Last November the War Pro- duction Board issued an order mak- ing it mandatory for all cities with populations over 25,000 to keep tin cans separate from refuse and deliver these cans to shredding, detinning or copper precipitation plants. A gross ton of the cans contains 2,218 lb. of scrap iron, and 22 lb. of tin. These materials are wasted if the cans are put through household incinerators or sent to municipal garbage dumps or incinerators.

As yet, few cities have found it profitable to engage in salvage opera- tions but their efforts are making a substantial contribution to promotion of the war effort. The practices of most cities are designed to meet the requirements of sanitary and econom- ical disposition of waste, and there- fore are not readily adaptable to the recovery of salvageable material.

However, at Highland Park, Mich., near Detroit, where refuse disposal ac- tivities were reorganized shortly be- fore the war to provide for salvaging of waste materials, a year's operation has produced a profit of $15,867. Total recovery was 1,600 tons of scrap, paper, rags and miscellaneous items from 60,515 cu. yd. of rubbish collected from 52,000 residents.

In their search for a low-cost, sani- tary method of refuse disposal that would not involve the use of critical materials, both the army and the U. S. Public Health Service have decided independently that the answer was to be found in the employment of land- fills. It will be remembered that San Francisco, Cal., Seattle, Wash., and New York City, among other Ameri- can cities, have been successfully using this method of disposal for some years. Not only is it cheaper than any form of disposal but at the same time it provides a means for reclaiming low-lying and otherwise valueless land.

Hundreds of army camps and posts throughout the country are now using or planning the adoption of the sani- tary fill method. Broadly speaking, the landfill procedure as outlined for army camp application (*ENR* Dec. 17, 1942, p. 851) is similar in tech- nique to that employed by some mu- nicipalities. Perhaps the greatest de- parture from any previous practice— at least so far as equipment is con- cerned—is the Army's adoption of recently developed equipment known as a "bull clam" shovel. This mech- anism, attached to a tractor, is capa- ble of performing as a scraper, a bulldozer or a power shovel. It com- bines in a single unit means for exca- vating trenches, leveling refuse piles, digging, moving and spreading cover fill, as well as compacting deposited material.

Adding further to the interest in landfill operations are some results from research work undertaken by New York University in cooperation with the New York City Department of Sanitation, and financed in part by the federal government. One of the findings indicated that it was desirable to add water to a fill in order to hasten decomposition; aver- age moisture content of the fill mate- rial in New York was about 24 per- cent but experimental evidence points to the desirability of keeping the mois- ture between 40 and 80 percent. Other studies dealt with the type and magnitude of settlement in a refuse fill as well as load-bearing character- istics of this material. From these it is revealed that consolidation, al- though rapid for a few months, will continue over a period of years; and tests indicate that uniformly distrib- uted loads up to 2,000 lb. per sq.ft. will be supported on fills that are no more than two years old.

Feeding of garbage to hogs has long been frowned upon, particularly in the light that this practice is an important contributor to the spread of trichinosis. Latest move to dis- courage hog feeding is an amendment to the U. S. Public Health Service's quarantine regulations requiring that all garbage shipped interstate shall be cooked before being fed to hogs.

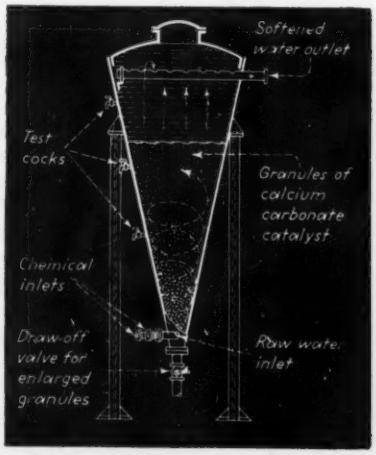


Fig. 4. Something new in the municipal water softening field is the Spiractor process. Water enters at the bottom of the tank, circulates upward through a bed of granular catalyst and emerges as a softened effluent.

The job ahead

Although present-day problems are of first concern, engineers and gov- ernment authorities are not overlook- ing the fact that plans must be laid for the postwar period when a huge volume of public works must be un- dertaken to supply deferred needs as well as provide for employment of some of those now engaged in war industries.

Active efforts to build a reservoir of local projects began early this year with the creation of a Public Works Reserve agency by the federal govern- ment, but this work has been brought to a halt by lack of funds. However, a surprising amount of local activity has taken place in the realm of ad- vance planning. About 50 communi- ties now have drafted six-year works plans, which could be translated into active projects quickly.

Construction Under War Controls

The greatest construction year in history was also one of new contracting procedures, of equipment and materials rationing, of price and profit limitations and of extensive labor unionization.

R. B. Colborn

LATE IN 1941, construction was showing signs of tapering off from a level of about half a billion dollars a month. Contracts for substantially all the military and industrial facilities required to support what had seemed to be a tremendous defense program had been awarded; building of most of them was over the hump.

Suddenly, "defense" became "war." In rapid moves, the military doubled, tripled, quadrupled their plans for men and munitions. Corollary construction went up in the same spiral.

It took a few months for this new wave of construction to get fully underway, but by March work installed started to turn steeply upwards, reaching a peak in August. In that month more than $1,500,000,000 was spent for capital goods for war.

In this situation, obviously, no effort, and particularly no materials, could be spared for non-essential work. Early in April, therefore, the War Production Board issued limitation order L-41 forbidding the initiation, without federal approval, of any new construction job after April 9. This didn't, and wasn't intended to, stop non-military construction. It did keep it under control by requiring anyone who wanted to build anything bigger than the tiny jobs exempted from the order to come in and ask permission.

By October, it was becoming evident to everyone that too much was being built. Much better information was available by that time as to the relationship of raw material supply and demand; production programs were being scaled down; the 1943 objective for the size of the Army had been cut from 10,000,000 to 7,500,000 men. Many plants already built or building, it was clear, would never be able to operate at capacity. And the capacity of newly built plants was proving to be much higher than expected.

WPB, therefore, really started to cut down on construction. Facilities units were set up in WPB to review all present construction projects to see whether they should be stopped and to pass upon all plans for further work. First move was to cancel priorities and order work stopped on a good many jobs which, it had previously been felt, had an auxiliary value to the war effort—such jobs as hydropower projects not scheduled for completion before 1944, road jobs, flood control work, and the like.

By the year end, about $1,200,000,000 of such work had had its priorities cancelled. And slated for cancellation was about $2,000,000,000 worth of direct war projects, either recently started or not yet under construction.

Special contracting procedures

As was perhaps to have been expected in a war year, the financial side of construction came under tighter government control than ever before. Three 1942 developments made the amount of a contractor's profit a matter almost entirely of federal dictate. These were (1) complete substitution of negotiation for competitive bidding; (2) introduction of renegotiation after completion of a job to prevent excessive profits; and (3) application of OPA price controls to non-federal construction.

Negotiation of contracts for war construction was nothing new. One of the first moves when the defense program started in mid-1940 was to authorize the War and Navy Departments to place contracts, where necessary, without competition. The services, however, still preferred to advertise for bids wherever time permitted. Except on the largest jobs, negotiation continued to be the exception.

To WPB, however, this didn't seem like the right approach, since in a war economy there are many factors at least as important as price in deciding who should get a particular contract. Late last Spring, therefore, the services, at Donald Nelson's direction, established negotiation as the standard method of awarding contracts.

But this was merely the prelude to the introduction of a new type of contract for big army jobs, intended to combine the advantages of the lump-sum and the fee contract. Payment of cost plus a pre-arranged fee based on a percentage of the *estimated* cost of the job became customary on large jobs early in the defense program. Not only did it save the time required to advertise a job in the usual manner, but, more important, it made it possible to award a contract and get work started before the design of the job was far enough along to permit calculation of a fixed price.

Admittedly, the fee contract reduced the contractor's incentive for economy. Moreover, because the amount of the fee was based on the work done by the contractor himself, it discouraged placing of sub-contracts with the smaller specialist contractors, even in cases where they could do the work more cheaply than the general contractor. Finally, the fee contract was distinctly unpopular with Congress, which several times considered outlawing it.

Accordingly, to recover some of the advantages of fixed-price work, the Architect-Engineer-Manager contract was evolved. Under this contract an A-E-M contractor is retained to be responsible for the design and to carry out, on a fee basis, the difficult complicated portions of the job on which it is necessary to make an immediate start. This normally amounts to perhaps 40 percent of the work.

Meanwhile, the A-E-M proceeds to complete designs on the simpler parts of the work—highways, water lines, grading, etc. As fast as any separable portion is designed, a fixed price con-

tract for it is awarded by the government, the contract containing a clause directing the contractor to work under the supervision of the A-E-M. After some experimentation, this type of contract was widely adopted on army work.

Profit control measures

Early in the year strong sentiment developed in Congress and the administration for legislation limiting the profit of contractors on war work. The Treasury proposed a limit based on the capitalization of the contractor, while most Congressmen favored a limit set as a percentage of the amount of work done.

The War and Navy departments opposed both plans, fearing that any inflexible rule would tend to retard war production. Instead, they proposed that Congress empower them, at the conclusion of any contract, to renegotiate the price in the light of the costs actually encountered in doing the work. This compromise proved acceptable, and late in May a law was signed giving the re-negotiation power to the Army, Navy, and Maritime Commission. A later amendment included the Treasury's procurement division.

A few general rules hold good, by and large. Small contracts are rarely renegotiated. The law itself exempts those under $100,000, and, for lack of time, the services, in practice, have concentrated on contracts over a million.

In the main, firms rather than contracts are renegotiated. That is, the service doing the re-negotiation looks into the total profit position of a contractor and asks for a refund if the profit seems excessive — without worrying much over what contract showed the excessive profit.

Responsibility for carrying out renegotiation rests with Price Adjustment Boards set up in each of the services.

Renegotiation, of course, applies only to contractors on war work. But the financial affairs of contractors doing civilian jobs are not free from regulation. Here the vehicle is the Office of Price Administration. Last Spring, OPA issued the General Maximum Price Regulation, which fixed the prices of most goods and services at the price charged by the seller last March.

In theory this order froze the price of construction, but in practice, the idea of a March price was too vague to mean anything. For practical purposes, therefore, construction was free from price regulation until last Nov. 5, when OPA issued MPR 251, a regulation covering construction inside the continental United States which is not done as a contract or sub-contract of the Army or Navy. It sets up two methods of computing a ceiling price. In the case of cost-plus contracts, the ceiling price is the actual cost plus a margin which shall be a percentage equal to the highest percentage margin received by the contractor for similar work during the 27 months preceding March 31, 1942. In the case of a firm-price contract, the contract price shall be the contractor's advance estimate of the costs (including an estimated reserve for contingencies) plus a margin figured as above. In both cases, the costs shall be based on wage rates at the level in effect July 1.

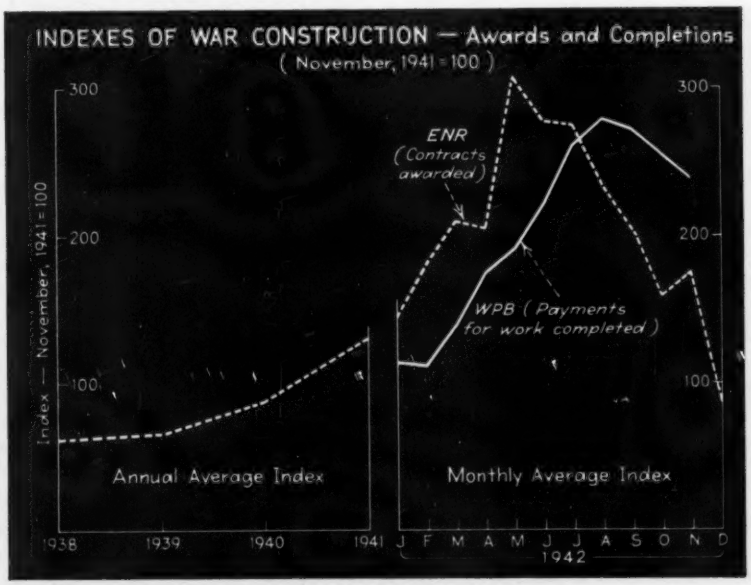
A contractor entering into a firm price contract must report to the nearest OPA office, at the beginning of the job, the estimates on which he bases his price. At the end of the job, he must report to the same office the actual costs encountered. No provision is made in the order for doing anything about any discrepancy between the estimated and the actual costs. The reports are to be confidential.

As OPA regulations go, this is a rather mild regulation. The industry, however, has been pretty unhappy about it. Contractors have resented the necessity of making reports to OPA. And, more important, they have feared that—no matter what the regulation said—it would somehow turn out that they would have to refund any excess of estimated over actual costs, thus in effect making all contracts cost-plus. In which case they would be deprived of any cushion against losses that might be suffered on other contracts.

Materials and priority ratings

The material supply situation presented only one important surprise in 1942. For three months (roughly May-August), use of lumber except on direct Army and Navy projects was practically forbidden by an order that required all but the smallest mills to sell only to the services. Much housing work was brought to a standstill.

There were constant experiments during the year with methods for distributing supplies to manufacturing plants. Construction buyers, however, continued to get their materials (or failed to get them) through the familiar system of priority ratings attached to project orders (P-19, P-55, etc.). There was, however, a tendency to concentrate more and more of the authority over issuance of ratings in the WPB rather than the services. This culminated late in the year when the ruling was established that all new construction projects must be cleared



How war construction rose and fell during the year. Contract letting (ENR index) reached a peak in May, field activity (WPB index) in August.

by WPB's Facilities Clearance Board or Facilities Review Committee.

One priority shift which did effect construction was the "re-rating" of last June. When the African second front was decided upon, a new range of AA priority ratings was developed and assigned to projects, which were supposed to be pushed through in the light of the new strategic situation. For contractors who received AA ratings, this meant a heavy burden of paperwork in re-rating outstanding orders, and for others it meant that their old A ratings became almost meaningless.

Equipment put under tight controls

Construction equipment became seriously short for the first time in 1942. This did not result from any curtailment of manufacture; in fact, manufacture ran at peak levels throughout the year. What caused the shortage was a tremendous demand from the armed forces for machines to equip their own engineer and construction regiments. This was accentuated by the developing policy of having work outside the continental United States done by troops rather than by contract. In the critical machines, such as tractors and shovels, military demand ran to some 85 percent of output, leaving little for contractors, even for those on important war work.

As early as last February it became necessary for WPB to forbid the sale of crawler tractors except upon an A-1 rating (at that time a pretty high rating). Three months later even this control had become inadequate, and tractors, shovels, and cranes were subjected to allocation. In order to buy one, a contractor had to make a specific application and obtain individual approval from WPB.

Late in the year, WPB placed the whole new-equipment situation under control with the issuance of order L-192. This order classified all types of equipment into several groups. Sale of the most critical types was forbidden except to the armed services. An intermediate group was subjected to WPB allocation, and the simpler types were left to be distributed according to priority ratings.

With the supply of new machines thus choked off, increasing reliance has been placed on mobilization of used machinery. In part, this occurred automatically as contractors, unable to buy new equipment, scoured the backroads for used stuff. In September, the WPB initiated a census of used machinery. Order L-196 required all machine owners to register their equipment with WPB regional offices and report the work it was engaged on. This information has been used to establish a sort of clearing house to put machinery buyers in touch with owners of equipment—such as cities and counties machines—that was idle or not doing essential work.

Stabilized wages and few strikes

An almost idylic calm pervaded construction labor relations during 1942. Man-days of construction work lost by strikes will amount, when the final figures are compiled, to something like 180,000. This compares with more than 923,000 in 1941, 493,000 in 1940. So unmilitant were the construction unions, in fact, that construction wages on the federal work, which formed the great bulk of the industry's activities, were stabilized at mid-year, several months before wages generally were stabilized.

The policy of the AFL Building Trades Department is largely responsible for the prevailing quiet—plus the fact that discipline in the building trades unions has been sufficiently strong to keep the membership in line. Though the unions have not been bashful in asking for more money, they have preferred, ever since the so-called OPM Stabilization Agreement of mid-1941, to push for a strong position in the industry rather than for the maximum immediate cash.

The procedure has usually been one of dickering with the government. The OPM agreement was worked out between the Building Trades Department and federal construction agencies under the sponsorship of the labor division of the then OPM. In the agreement, the unions limited overtime pay to time and a half and agreed that pay rates on any given job should be maintained constant throughout the life of the job. In return, it was agreed that when construction jobs are put in areas where not much work is normally done the high union rates prevailing in the population centers will be paid. Equally important, the unions got what amounted to guarantees that only AFL unions would be recognized on federal jobs plus pretty broad encouragement for the unionization of all federal jobs.

The OPM agreement continued in effect through 1942. It was successful in forcing the CIO's Construction Workers Organizing Committee out of the construction industry. CWOC found it impossible to get a foothold in government work, and as the volume of non-government work closed down, it found itself completely squeezed out.

Early in the year, the Building Trades Department began quiet discussions with contractors and federal agencies as to the possibility of a broad wage stabilization program. Both the Labor Division and the Department of Labor were involved. The Labor Division, however, had lost much of its influence when OPM was reorganized into WPB. The wage stabilization agreement which finally went through in May was worked out under the auspices of the Department of Labor.

The agreement provided that, in determining prevailing wages for federal construction under the Bacon-Davis Act, the department will base its determination on the rates in effect July 1, 1942. General understanding was that July 1 rates meant July 1 union rates.

Subsequently, non-federal work was brought under a similar control by the Office of Price Administration. OPA regulation 251 limits the price that contractors on non-military work may charge to an amount based, among other things, on July 1 wage rates. To the extent that the regulation is effective, therefore, it froze wage rates at that level by making it impossible for the contractor to pay more without taking the additional payment out of his profit.

Thus, when the President, in early October, imposed stabilization as of Sept. 15 on wages and salaries generally, construction was already in shape. This was recognized by giving the Labor Department's Wage Stabilization Board administration of the stabilization program as it applies to construction. The War Labor Board, which administers the freeze generally, now grants automatic approval to wage increases OK'd by the Wage Adjustment Board.

Despite the high levels of construction during the year, significant labor shortages failed to show up. At the August peak, about 2,131,000 men were employed on construction, with employment tapering off to something like 1,700,000 at the year end.

Transportation Under War Conditions

An unprecedented load of freight and passengers carried without undue distress. New highway and railway construction limited to that directly essential to the war effort.

V. T. Boughton

RAPID CHANGES occurred in the transportation outlook in the months immediately following Pearl Harbor, and for a time there was much uncertainty as to whether the nation's transportation system would be able to carry the added load that our entry into the war would put on it. A major contribution to this uncertainty was the threat of an acute rubber shortage that might immobilize a large part of our motor transport. Further complications were added by the submarine attacks on our coastwise shipping, attacks that added to the load the railroads had to carry and curtailed the use of motor vehicles along the Atlantic Seaboard. But no serious consequences developed, other than in the fuel supply for civilian use, and the nation's transportation system passed the October peak period successfully, which is in sharp contrast to conditions that developed in the first year of World War I.

A record freight year

When 1942 opened it was apparent that the nation's land transport system would be required to carry an unprecedented load, but none foresaw that the increase would raise the total so far above all previous records.

When the load of handling oil to the Atlantic seaboard was placed on the railroads by the attacks of submarines on coastwise shipping, they had an estimated capacity for moving 300,000 bbl. per day. In normal times, the Atlantic Seaboard consumes about one third of the nation's daily production of 3,800,000 bbl. By August the railroad companies had raised their capacity to 800,000 bbl. by putting the movement of loaded cars and empties on practically passenger-train schedules.

Meanwhile, pipeline movements of oil had been increased by adding new pumping capacity, by taking up and relaying little-used lines and by constructing new lines. Most notable of these is the "Big Inch" line from the Texas oil fields to Norris City, Ill., 530 miles, which now is being extended to Philadelphia and New York. Its capacity will be 300,000 gal. per day.

Less coastwise shipping

Sharp reductions in the coastwise movement of other commodities also added to the load to be carried by the railroads. Included was perishable fruit that used to move to coast ports by truck and then by ship to the North Atlantic ports, coal for New England, freight for South America moving overland to the Gulf ports instead of to the Atlantic seaboard, and lumber that formerly was shipped through the Panama Canal, now closed to commercial traffic. Also transferred to the rail lines was a considerable amount of freight that heretofore had moved in long-haul trucking operations.

And of course the restrictions on automobile use brought a new passenger load to the rail lines, to which was added the handling of 11,000,000 troops in group movements. This latter figure does not include individual soldiers going on leave.

All of this brought the freight moved in 1942 to 630 billion ton-miles which is 35 percent above 1941 and 55 percent over the 1918 figure. Passenger miles reached 53 billion, which was 86 percent above 1941 and 13 percent above the all-time record set in 1920.

Physical factors affecting the freight handling records include extensive installation of modern methods of signalling and a great improvement in warehouse facilities at the ports. No serious congestion developed at any one of the ports from failure to release cars promptly. Where bottoms were not immediately available, the contents of the cars were transferred to warehouses or to open storage.

Between Oct. 1, 1941, and the same date in 1942, the railroads put into service 783 new locomotives and 80,874 new cars. This was considerably below the number that the Association of American Railroads had estimated to be necessary to provide adequately for repairs and obsolescence.

Large improvement program

During 1942 the railroads were able to carry forward over $200,000,000 of new work, most of which was put under way in 1941 before material shortages became acute. This work included many improvements to yards and terminals and extensions or modernizations of signal installations. Only 74 miles of new railway line were built in 1942, according to figures compiled by *Railway Age*, and only 24 miles of second track. On the other hand, track construction to serve war industries and military establishments—work that was financed by the federal government—amounted to 8,000 miles.

Famous line abandoned

Railway line abandonment reached the all-time high of 2,516 miles in 1942. This was due in large part to the acute steel shortage, lines being taken up to provide rails and fastenings for tracks to serve war industries or to provide scrap to offset purchases of new rail and fastenings. Much more line abandonment is proposed for 1943, and in this the railroads will have the powerful support of the War Production Board because a large amount of scrap can be obtained in this way.

Longest of the lines abandoned in 1942 was the famous Southern Pacific Ry. line from Lucin to Ogden, Utah, 142 miles, where, on May 10, 1869, the Union Pacific and the Central Pacific construction crews met and a golden spike was driven at Promontory Point to signalize the completion of the first transcontinental railway.

Maintenance work increased

Maintenance expenditures for 1942 are estimated by *Railway Age* to have reached $790,000,000 as gainst $603,000,000 in 1941, thus exceeding any year since 1929, but still below what is believed to be necessary to maintain the properties properly. And these figures do not fully reflect the maintenance conditions of the railroads because large expenditures were made for work not requiring critical materials, like ballasting, while rail renewals were restricted to the available supply of steel.

More freight on the highways

Statistics for freight moved by highway are not available, but judged by figures for gasoline consumed by motor vehicles, the mileage of truck travel in 1942 was about 9 percent above that of 1941. Total motor fuel consumption fell off 17 percent, consumption in the initially rationed states being off about 25 percent and in the remaining states 12 percent. However, these consumption figures probably do not clearly show the total increase in freight moved by highway as records of the state highway departments show that the average load per truck rose considerably during the year. This had a significant effect on maintenance operations, as will be noted subsequently.

Highway plans changed

As the year 1942 opened, highway thinking was still dominated by the defense philosophy of the preceding years, and improvement of the strategic highway network still was uppermost in planning. That thinking changed rapidly as the nation got into its stride in the great war program. Now it is quite generally recognized that no highway building not directly connected with the war effort will be undertaken. Access roads to industries, or roads needed to relieve bad congestion around war industries, will be built, but all other work must wait. Maintenance of the roads we now have in condition to carry the war traffic is the order of the day; and each day serves to add new emphasis to the fact that this is going to be a major task.

The problem of road maintenance

Though passenger-vehicle travel has declined sharply in all but some of the centers of intense war activity, truck travel and truck loadings, which are the controlling factors in road disintegration, have risen, and doubtless will continue to rise this year. That means more wear and tear on pavements, especially on the older roads that are at or near the end of their useful life. And curiously enough, it is these roads that must bear most of the war load because our early road work was in and around the centers of industrial activity.

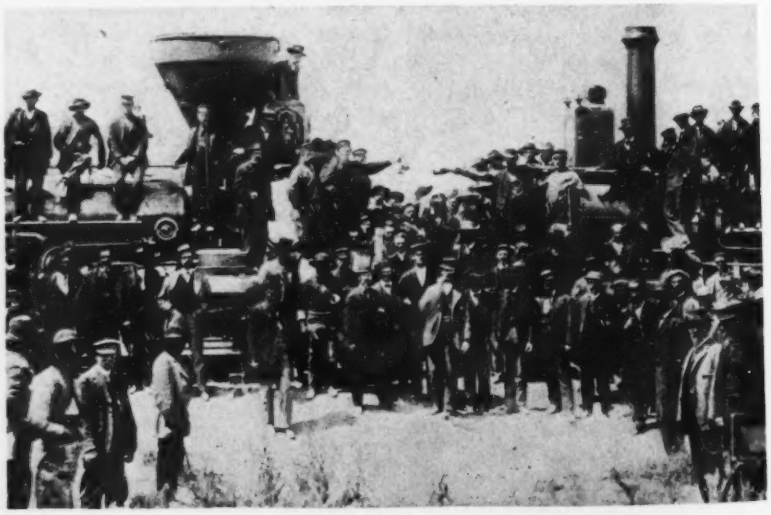
In a normal year, this country replaces about 18,000 miles of old highway, either because those roads have reached the end of their useful life or are of inadequate capacity. With all such replacements eliminated for the duration, it is obvious that maintenance operations in most states will rise progressively as long as the war lasts. Lack of men, materials and equipment, and declining revenue from motor-vehicle taxes will make this difficult.

Reduction in private automobile travel combined with the reduction of speed to 35 miles an hour, which was put into effect early in 1941 to conserve rubber, has produced some interesting corollary effects. These departures from normal practice have made it possible to eliminate traffic signals at many points—thus indirectly conserving both fuel and tires by reducing the number of stops and starts—and has made pavement widening unnecessary on many roads where widening was becoming urgent at the higher speeds of pre-war days. This latter development has made it possible for some highway departments to increase materially the amount of resurfacing that could be done, old pavements being resurfaced at their present width, using the material that otherwise would have gone into widening to add to the mileage of resurfaced roads.

Highway to Alaska

Outstanding among road-building operations of 1942 is the great job of opening in less than a year 1,670 miles of highway from British Columbia through Yukon Territory to Alaska. Today that highway forms a priceless link in our war transport system, serving airfields along air lanes to Alaska and providing a land route over which military supplies can be moved into Alaska out of reach of attack that might close sea lanes to that important outpost in our defense system.

Work now is being pushed on a highway from Haines, at the head of the so-called Inside Passage along the Pacific Coast, to connect with the Alcan Highway northwest of Whitehorse to give a combined sea and



Torn up to provide scrap steel during 1942 was the historic railway line where, on May 10, 1869, crews building the first transcontinental railway met at Promontory Point in Utah.

ghway route to the interior of laska that will have many advanges over the long overland route at freight must travel to reach laska by way of the new highway. his combined highway and sea ute through waters that can be sily protected provides insurance gainst interruption of the flow of pplies to Alaska should spring oods wash out bridges or other arts of the Alcan Highway.

That the government now is confient that it soon will have adequate ransportation to Alaska is indicated y the fact that, after pushing to comletion surveys of a railroad line to laska, those plans recently were helved indefinitely.

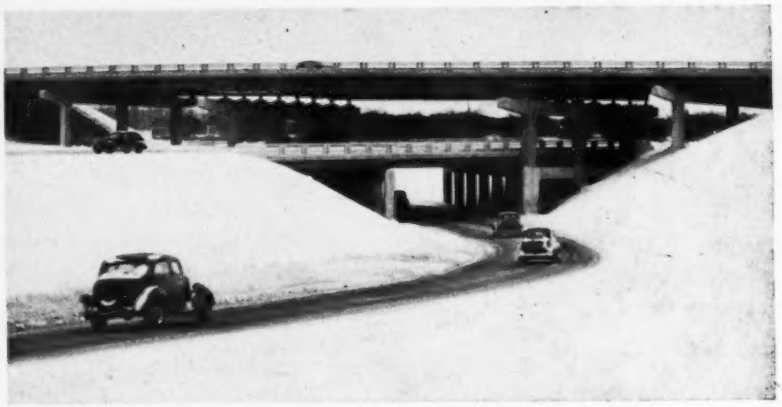
Inter-American Highway

Other highway work that is closely ed to the nation's war effort is conruction of missing links in a road xtending from Texas south through Mexico and Central American counries to the Panama Canal. A paved oad now extends from the Texas borer south through Mexico City to ear Oaxaca in Southern Mexico, and he Mexican government is actively ngaged in extending that road to he Guatemala border. South of that oint no road exists or there are only rails for 625 miles of the distance o Panama City. In July of last year our government entered in an agreeent with the Central American overnments for completion of a pioneer road" over the uncompleted ections of the projected highway. It s to have a width of from 8 to 10 t., to be surfaced with 8 in. of gravel nd to have grades not over 10 perent.

For military reasons, little inforation concerning the work in hand s available. Supervision of the work s under the Public Roads Administraion and some American contractors ave been engaged, but it is believed hat a large part of the work is being one by the local governments with ative workmen. American engineer roops also may be engaged on the ork, as in the case of the Alaska ighway.

Air transport

A record of the whole accomplishent of the nation's air transport sysem in 1942 probably cannot be writen until after the war because much as done for the armed forces that oes not show up in the public record.



Only highway construction necessary to the war was carried forward in 1942. Here, traffic into the Ford Willow Run plant is separated from the homegoing shift, and both move independent of the main-road traffic, which crosses on the upper level of this three-level grade separation.

Domestic airlines flew 1,560,000,000 passenger-miles, an increase of 14 percent over 1941, with a fleet of airplanes reduced from 352 to 165 by the surrender of equipment to the government for military purposes. Air-express increased 106 percent to 39,570,000 lb. Daily miles flown, per plane, ranged from 1,200 to 1,500.

Waterways

No major additions were made to the nation's inland waterway system in 1942. Traffic on the waterways is believed to have increased materially, but for some inexplicable reason, these figures are considered to be military secrets. Very large amounts of traffic moved through such deep waterways as the Chesapeake-Delaware Canal and Cape Cod Canal to avoid going out into the open ocean, and smaller vessels sought the protection of the intra-coastal waterway. Movement of freight on the canalized rivers probably increased considerably but was handicapped by lack of adequate equipment.

City transit sets a record

Passengers handled on city transit lines increased about 30 percent above 1941, setting an all-time high of 19 billion riders. Restrictions on passenger car use and expanding war industries were responsible for this record. The largest increase occurred in the 17 Eastern states where restrictions were placed on automobile use in May.

Purchase of transit equipment also made a record, amounting to 12,000 motor buses, 450 electric trolley buses and 300 electric rail cars. In addition, many old cars and buses were put back into service. In a few cities, abandoned trolley lines were restored to use to meet needs for mass transportation.

Looking ahead

It seems probable that in the coming year the most critical conditions will be found in city transit operations. One has but to see the large number of antiquated buses that now carry capacity loads to realize that provision must be made for many replacements if city transit is not to break down under the load it now is carrying. And the load is expected to increase as more private automobiles are taken out of service due to restrictions on gasoline consumption or because of obsolesence.

In a similar, but probably less acute manner, the railroads will find their capacity limited by the cars and locomotives that they can replace or rebuild. And both the railways and highways must have materials, equipment and repair parts for use in maintaining track and roads.

Thus, the question of how well the nation's transportation system can carry the load that the war will put on it this year centers on how the task of meeting its needs can be integrated with that of maintaining adequate supplies for the armed forces. There is good reason to believe that some of the current restrictions on manufacture of equipment and materials for civilian use can be relaxed, in which case those responsible for the successful operation of our transportation agencies can look ahead with considerable confidence.

Shipbuilding Finds Its Stride

Construction contractors have attained unprecedented speed in building 10,000-ton freighters through sensational extension of welded fabrication methods to units weighing as much as 210 tons.

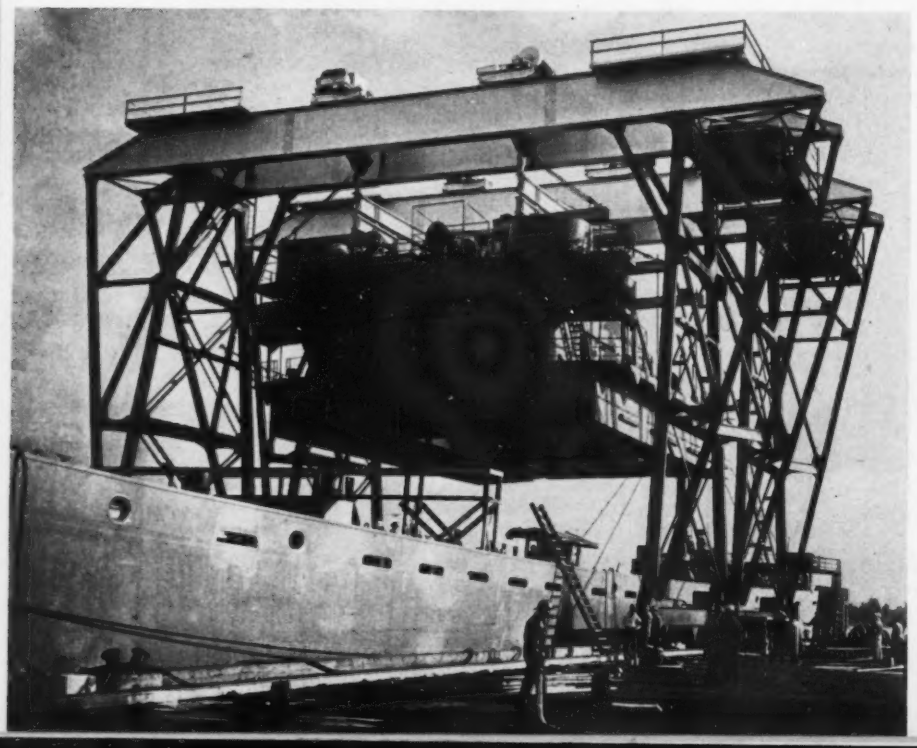
N. A. Bowers

"UNDER NEW MANAGEMENT" will be an appropriate heading for the chapter in history that records activities in merchant shipbuilding in the present emergency. Instead of old-school shipbuilders of long training and experience, it is chiefly men from the construction industry — contractors, engineers and their organizations— who have responded to the challenge to build ships quickly. These newly formed organizations, unhampered by precedent, had varying success at the outset—some surpassed others and there were some consolidations—but the foundation was laid for a new technique in building of cargo ships employing methods so revolutionary in character that they could not be put into final efficient shape all at once. Time was required for the new industry to find its stride.

Prefabrication and welding are major factors in present-day speed that have been adopted by all of the major shipyards. Typical of what these methods make possible are the succession of broken speed records on individual ships, culminating in the spectacular launching of a Liberty freighter in 4 days 15 hr., and completion in 7 days 14 hr. (Richmond shipyard No. 2).

The really substantial measure of success in meeting the need for ships, however, is not speed on any one ship but total output. Output had been low. For 15 yr. (1922 to 1937) American shipyards produced only two ocean-going cargo freighters. Then, in the emergency, plans were laid to step up production from very little to 24 million tons (some 2,300 ships) in a 2-yr. period, (1942-43).

Prefabrication reached a 1942 peak in these 210-ton superstructure section, entirely complete, assembled on a production line and lifted bodily to place on a floating hull by a specially-designed gantry crane.



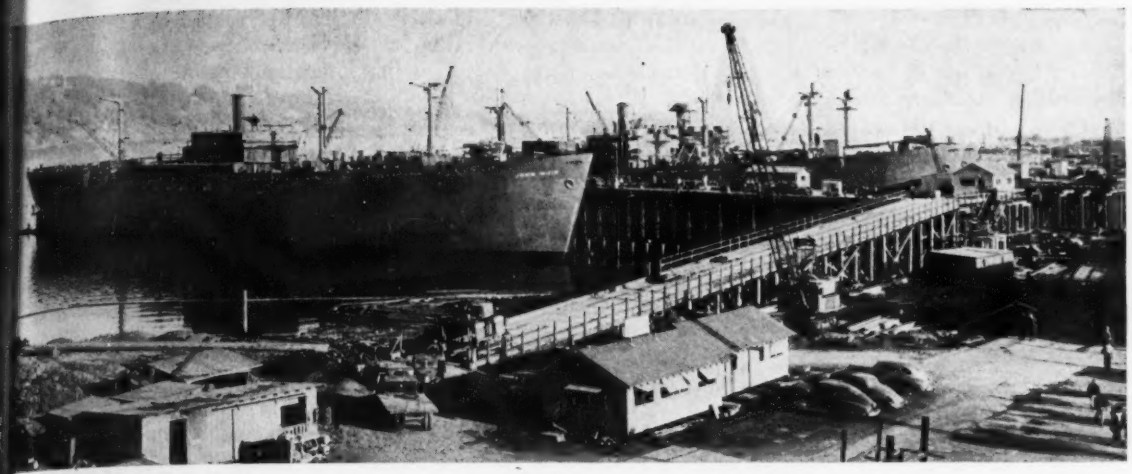
Heeding the experience of World War I, heavy concentration in large yards, such as Hog Island with its resultant bottlenecks, was avoided; now shipyards are in 24 states, supplied by some 1200 factories scattered all over the country. This decentralization has permitted prefabrication, welding and other time-saving methods to be really effective. The average time for completing a 10,500-ton freighter (EC-2) was 228 days as of March, 1942. By December this average had been reduced to 55 days. In the 12 mo. of 1942 the number of man-hours per EC-2 was cut to less than half that formerly required.

Advantage of prefabrication

The primary advantage in prefabrication is decentralized assembly, which avoids congestion and interference between crews. The general idea antedates Pearl Harbor but in 1942 much advance has been made. The size and weight of sections of shell, bulkhead and superstructure that have been put together as separate units and then lifted bodily to place have steadily increased. High mark for the year was reached in the unprecedented total of 210 tons, the weight of deckhouse assemblies, complete even to electric light bulbs, which the production line at Kaiser's Vancouver yard delivered for placement in one piece on hulls after launching.

Lacking experience with prefabrication, the yard layouts at first provided inadequate space for working on, handling and storing the assorted sections of large size. It was difficult to foresee how large such areas would have to be. Nearly all the yards laid out a year or more ago have had to find means of increasing areas used for this purpose.

Moving the large, heavy sections has been a problem typical of present



The deck-high outfitting dock provides a convenient working and delivery level, eliminates the man-hours spent in climbing up and down, does away with the need for gantry cranes for this part of the work.

day shipyards. Standard gage railroad tracks, motor trailers and gantry cranes are all used in different yards, with the last named usually a necessity at the ways because of the high lift. Gantry cranes have become scarce to unobtainable, and where possible substitutes have been devised. One yard uses an overhead-type crane over each way made up of a hoist traveling on a bridge whose ends rest on A-frames mounted on railroad trucks. The high-level outfitting dock does away with gantries for outfitting.

Welding advances

Because welding is quicker it has replaced most of the riveting in merchant ship construction. Usual practice now is to use rivets only for rib-to-shell connections. Strength of welded joints equals or exceeds that of adjoining plates. Prequalification of welders and use of modern equipment and electrodes has increased the dependability of welds to a point where only visual inspection is normally used.

Extensive use during the past year has greatly strengthened confidence in electric welding. Even though much less time is now put on welding instruction (courses now average 120 hr. of lectures and practice welding as compared to the former 300 hr.) and despite a decidedly less reliable class of labor, the percentage of welds found defective and requiring repair is almost negligible. When defects do occur, repair does not always require chipping out and rewelding; it is sometimes sufficient merely to put on an additional layer of metal.

In contrast with riveting, which requires that riveters be served by rivet heaters, passers and buckers-up, one man can operate the welding outfit, and he can make satisfactory joints where there is access to only one side.

Extensive studies have been made on "plug welds," in which a hole through one of two members to be connected permits a weld to begin at the bottom of the hole, filling it with metal at the same time that the new metal is fused and bonded with that of the adjoining plates for a more effective joint (as strength tests show) than is possible with a rivet. On a recent job, using one portable welding unit, 76 plug welds per hour were put in on $\frac{1}{2}$-in. steel plate.

Speed and efficiency are so much greater in downhand welding that sequence of assembly operations and facilities for rotating parts, as they are being welded, have been worked out accordingly. In some yards 60 percent of all welding is downhand work.

Because the speed of automatic welding is about four times the hand welding rate, automatic machines are used wherever the time spent in setting up and taking down equipment does not offset this advantage. Practices in different yards vary widely in this particular. The use of a crane is required to set the automatic machine in place, and it may be quicker to do a small job by hand than to wait until the crane is available. Some yards use automatic machines on the ways; others make a practice of depending exclusively on hand welding for all work done in this part of the yard.

With the larger welding rods ($\frac{1}{4}$ and $\frac{5}{16}$ in.), only three passes are required in hand welding operations to complete joints in the $\frac{3}{8}$-in. shell plates of modern freighters. Some yards concentrate on hand welding to the extent that more than 90 percent of it is done in this way, leaving to automatic machines only the heavier work in prefabrication areas where setting up and taking down the necessary equipment can be done more quickly.

A high-level outfitting dock

Where all prefabricated sections, in many cases nearly 100 percent complete, are put aboard on the ways, the heavier lifts are all made before launching. If this plan is followed the outfitting docks need not handle loads of more than 7 or 8 tons, a service for which truck-type cranes are adequate. They are speedier and more flexible than the high-level gantries ordinarily used.

To improve outfitting dock work, Marinship of California uses a high-level deck, accessible to trucks by a 5 percent ramp, built up to the deck level of the floating ship (about 31 ft. above M.L.L.W.). Such a dock has other advantages, such as elimination of the time lost by workmen in climbing up and down, greatly simplified utility connections and a 20-ft. reduction in the usual lift of materials from dock to shipdeck.

The high-level dock, that went into service in the latter part of the year, has materially shortened the time for making deliveries by crane, affords a very large saving in man-hours and simplifies making connections for oxygen, acetylene, electrical energy,

compressed air and water. Deck space is reserved for storage so that supplies of parts and materials can be kept close at hand. Below the deck is space for lockers and washrooms; workmen ordinarily do not leave the dock during their shift.

Manpower problems

Scarcity of manpower has been a problem of steadily increasing importance. Dependence cannot be placed on men subject to the draft nor is it worth while to train and break in men whose period of service may be short. One answer has been the training of women workers, and an increasing percentage of them is noted in many yards. With the highly mechanized operations of the modern shipyard, they can handle many of the jobs formerly held by men exclusively.

A shipyard custom has kept women workers off the ways—presumably because of the relatively greater danger and amount of climbing involved. Precedent for disregarding this custom has now been established, and there are indications that women may take over 20 or 25 percent of the work in some yards. They are generally conceded to make better welders than men. Trade unions have been hostile toward women members, and there have been arguments and delays on this score. These objections are being forced aside and women are now getting the same rating and pay as the men they replace.

The "expediters" that have been brought over to the shipyards from the heavy engineering construction field have been a brilliant success. Mostly energetic, quick-thinking young men, trained to be diplomatic, but rated on ability to get results in any situation, these workers have had one of the most important assignments in organizations geared for high speed.

Their chief assignments have been on shortages of materials or delays caused by priorities, lack of transportation or factories shut down by strikes. Wherever any such difficulties menace or stop the flow of materials that are lifeblood to the shipyards, the expediter is rushed to the scene. The ramifications to this problem are illustrated by the fact that, in addition to steel plates, there are 9,640 groups of items in the bill of materials that go into a Liberty ship.

Part of the Maritime Commission's plan for 1942 includes concrete barges, and they are by no means "scows." They have ship-shaped prow and stern like other seagoing vessels, and the length of 360 or 375 ft. with a beam of 54 or 56 ft. gives trim lines and attractive appearance. Contracts have been awarded for 91 barges designed to be towed, and for 44 of the self-propelled type. The first concrete ships to be built in 22 yr., these vessels are designed to save 30 percent of the steel required in steel vessels of the same tonnage. Actually, the advantage is more than the steel saving as no plates, the real bottleneck of steel production, are required. Also concrete ships tap a different source of labor and management than is being used on steel ships. In coastwise oil deliveries these barges are expected to take the place of an east-west pipeline at a small fraction of the requirement in steel.

Regardless of whether concrete ships will be popular or economical after the emergency need for shipping ends, experience with lightweight aggregate gained in their construction will have widespread benefits. In these ships, unlike other uses for lightweight concrete such as bridge pavements, insulating walls, etc., a high strength requirement has to be met—specifications call for 5,000 lb. in 28 days. More emphasis than ever before has thus been put on lightweight aggregate.

New lightweight aggregates

Tests were made at a Florida shipyard with materials and methods which indicate that concrete weights can be kept as low as 83 lb. per cu. ft. This is with a method that puts a light coarse aggregate of uniform size into the forms dry and then fills the voids with cement slurry forced in under pressure. Lightweight concrete mixed and placed by the ordinary processes has been made with eight sacks of cement per cubic yard, developing 6,000 lb. in 28 days and with weights not exceeding 100 lb. per cu.ft. in experimental work.

Lightweight aggregate has long been made in the coarser sizes with no difficulty. Where fines must be supplied by natural sand exclusively, the resultant concrete is too heavy to give best results in concrete ships. However, recent developments in the manufacture of lightweight aggregate have solved this problem and a sufficient percentage of lightweight fines can now be made economically. An important feature of this new development is in calcination at incipient fusion temperatures. While the material is thus softened, sharp corners are rounded by the rolling movement in the kiln. The sealed surface on each particle, which greatly decreases absorption, and the rounded corners that are attained in the nodulizing and calcining processes, improve workability and make for smooth surfaces in the finished concrete.

It is entirely possible that later application of these advances in the field of lightweight concrete will be of greater importance than and will outlive the need for concrete ships.

Refinements expected

Further changes and improvements that may be expected in shipyard operation are largely in the class of what might be generally described as "refinements." Better materials and equipment, more skillful workers and better organized crews are the changes that can best increase the efficiency of present operations. A high rate of labor turnover always lowers efficiency. On the other hand, the manager of one important yard estimates that a 10 to 20 percent increase in speed would immediately result if workers really did their best.

Now that new methods have been pretty well standardized, more attention is being paid to costs. The contractors have always been cost-minded and there is an increasing tendency of government agents to swing that way. With prices and critical material supplies as they are, salvage is becoming increasingly important.

There is prospect for increased emphasis on "specialty crews"—men trained to perform one particular operation repetitively. At the larger yards there may be as many as 200 such operations. Not only is the work thus done better and quicker by the "specialists," but since each worker has a very restricted responsibility his substitute (and his replacement, when he is drafted) can be trained in less time.

Increased attention is being given to ideas handed in by workers for improvements in methods or equipment. More endeavor is being made to encourage and promote the willingness of the men to make such suggestions. The suggestion-box plan, now widely used, is gaining in importance.

Bridge Design and Construction

Activitiy in 1942 was at a low level, although several notable bridges begun earlier were completed, and small timber and unreinforced masonry structures increased in number and variety.

Waldo G. Bowman

THERE WERE FEWER developments in the field of bridge design and construction in 1942 than for many years past. That this should be so during a time when all possible energy, money and materials had to be focused on building war plants was inevitable. On the other hand the fact that bridge construction could be allowed to lapse without unbearable harm to our war transportation system speaks well for the excellent job of bridge building done in the past. This does not mean that a backlog of necessary new bridges is not being accumulated. It is; and like our neglected highways, bridges will require immediate and large scale post-war attention. As a consequence, any research, studies or designs, which can be sandwiched between necessary war jobs, should prove to be good investments in both time and money.

Volume only half of last year

In point of expenditure, the 58 million dollars spent on bridges in 1942 was just about half what was spent in each of the previous two years, and hardly one-third of the 1939 volume. Except for a half-dozen fairly large structures, which were started earlier but continued in construction during 1942, the past year was characterized by small bridges, the majority of them being in grade separations or on stream crossings on access roads to war installations.

The shortage of steel stimulated the use of timber, unreinforced concrete and masonry, and some interesting structures resulted. For example, a bridge over the Brazos River in Texas was built of 19 native stone arches of about 20 ft. span.

Most notable of the large bridges is a continuous tied arch of 845-ft. main span and 347-ft. side spans, across the Mississippi at Dubuque, Iowa. A European type, its only counterpart in this country is a bridge of 264-ft. span, completed two years ago, over the Meramec River near St. Louis. An innovation of considerable significance on the Dubuque Bridge is the complete absence of fixed shoes, all supports being on rockers. Such an arrangement eliminates torsion in the piers and the consequent damage that sometimes results when shoes are fixed. The necessary lateral fixity of the structure is provided at the end piers.

Running the Dubuque Bridge a close race in point of significance was the Connecticut River crossing at Hartford, named the Charter Oak Bridge, whose continuous plate girder spans of 270-300-270 ft. are the longest in this country. It will be recalled that one of the 270-ft. spans collapsed during erection in December, 1941, but a new attempt with stronger falsework proved successful, and the bridge is now open to traffic.

Other large bridges of the year included a continuous truss of two 670-ft. spans across the Mississippi at Chester, Ill.; the double deck railway and highway bridge over the Pit River in California which is supported by the world's tallest piers, 350 ft., and designed to resist earthquake shocks; and a long truss bridge across the Thames at New London, Conn., whose main span is a 540-ft. cantilever and whose main piers are founded on steel H-piles driven 135 to 150 ft. below low water.

In London, England, completion of the new Waterloo Bridge was an event of importance because its five 250-ft. hollow concrete box girder spans set a new record for this type of construction. The majority of hollow girder bridges in this country are on the West Coast, and during the past year the California highway department built one on a 200-ft. radius curve to solve a difficult location problem successfully. The torsion stresses inherent in curved layouts are readily resisted by the top and bottom slabs of the box, which may also be supplemented by easily-installed diaphragms.

Some research carried on

Research affecting bridges was also at a low ebb, although two projects are worthy of mention. Tests on wide flange steel columns by the American Institute of Steel Construction at Lehigh University developed new information on local compressive strength and on behavior under eccentric loading. This program is being extended to a study of the action of such columns in structural framework, and the results should prove useful in truss designs.

The other piece of research related to the design of the new Tacoma Narrows Bridge and involved studies of a 1:50 scale model 100 ft. long, in a special low velocity wind tunnel at the University of Washington. The tunnel is unique in providing for the introduction of lateral wind loads along the entire length of the model. The new bridge will be a suspension structure of the same span lengths as its ill-fated predecessor, but it will be four instead of two lanes wide, and it will utilize trusses instead of girders as the stiffening members. The towers and cables of the old bridge are being dismantled and sold for scrap.

The outlook for 1943 in the bridge field is for continued low activity. It will be chiefly a maintenance and repair year, although extended use of timber trusses and of unreinforced masonry arches can be expected where new structures are absolutely necessary.

Notable Practices on War Construction

Use of alternate materials and rebuilt machines enabled constructors to meet war's limitations. Structures and forms planned simultaneously have simplified and speeded concrete construction.

Hal W. Hunt

CONSTRUCTORS have been asked to do more, with less, during 1942 than in any year in history. They have succeeded. The largest jobs and fastest schedules that man could visualize were given the construction industry with one hand, while the other hand slowed the flow of materials, stopped the purchase of new equipment and repair parts and took personnel for the armed forces. Yet the schedules were met and, in the process, the ability to use substitutes for scarce materials, to repair and even to rebuild machines in the field emerged as the outstanding construction contribution of the year.

The problem of materials

Of all materials adapted to new and expanded uses, timber probably leads by a wide margin. Most notable new development in timber was the use of glue in fabricating laminated beams, girders and parts of trusses. Glue has long been used in many industries, but in engineered construction it has been confined largely to plywood. Now, however, glue goes to the job for fabrication of working members in the field as well as in mills.

In many uses the glue holds by itself, but in others it is supplemental to or is supplemented by metal connectors or nails. Girders of plywood 5-ft. deep and 24-ft. long, with wood flanges made integral with glue and connectors, have been designed to carry rails for a 20-ton crane. Girders of timber and plywood are on the commercial market ready for delivery in a range of sizes.

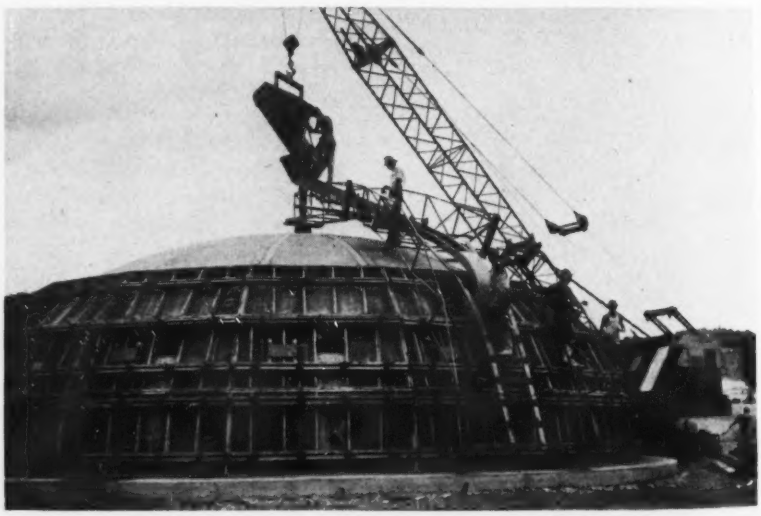
Various types of trusses were prefabricated on modern assembly lines established on jobs as well as in mills. Lumber moves into a shop on conveyors, for marking, cutting, and boring, and on to an assembly area where the parts are made into a complete truss. In some construction, wood dowels replaced bolts, and plywood squares, under a small cut washer, eliminated large steel or cast iron washers.

Shortages forced the use of other non-critical materials, and structural clay block, brick, rubble masonry, glass-block, asbestos-cement, gypsum and plaster board, cement block, and even rammed earth were in great demand.

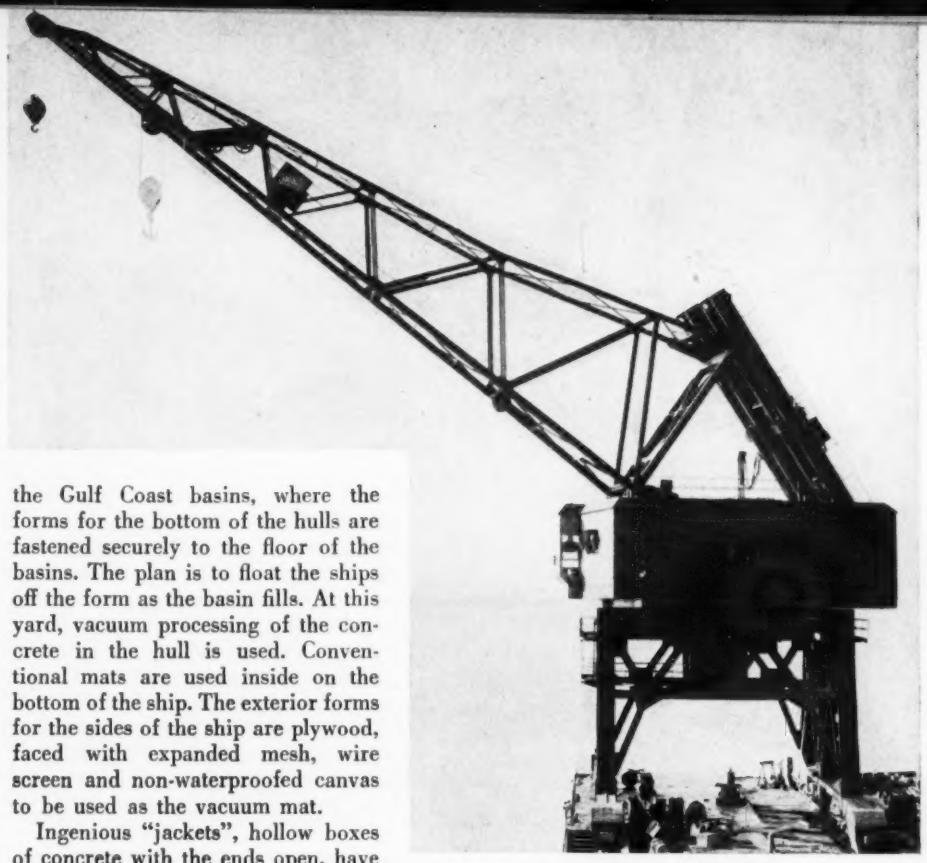
In addition to the problems incident to materials shortages, keeping equipment operating was a major task in 1942, but "ingenuity and baling wire" came to the rescue. A new procedure in the construction field was the rebuilding of worn parts by metal spraying. Building up wearing surfaces with beads of hard-facing rod was also greatly extended. On a drydock job, using a large number of concrete pumps, liners for the cylinders have been pressed out of mild steel, machined to shape and then hard-faced on the wear points to make a good-as-purchased part.

Forms influence building

Development of concrete forms adapted for speedy moving has greatly extended the utility of the one-story concrete building. Outstanding have been flat slab roofs in 22x40-ft. panels designed by Raymond Reece of Toledo, and built by Skilken Bros. of Columbus, Ohio. (*ENR*, April 23, 1942, p. 622); and in 20x38-ft. panels designed and built by a Mahony-Troast-Albert Kahn combination (*ENR*, Oct. 22, 1942, p. 583). The structures were designed to have no projections below the flat slab to interfere with movement of a travelling form. The forms were built as nearly as possible in one unit with



Beehive magazine for storage of munitions has been substituted for the more common semi-cylindrical igloos at several depots. Sixty were built on one job on Labor Day, a record in igloo construction.



(Dravo Corp. photo)

Screw luffing for big cranes eliminates multipart boom lines and gives "micrometer" adjustment in setting loads. Capacity is 75 tons of 104 ft. radius.

…es and soffits for the beam arranged …be supported, stripped and moved …ead, on the traveller.

Two huge one-story buildings, …ade up of a series of 38-ft. span …rrel arches, were also built with …ovable forms despite the presence …f frequent beams below the roof …b. Use of chain hoists for lowering …e arch forms below the beam bot…ms, when moving the traveling rig, …abled the contractors, Geo. A. Fuller … one job and Long-Turner Con…ruction Co. on another, to erect the …ildings very rapidly.

Winter concreting has been used …tensively on much war work that …nnot wait on the weather. Oil-…urning salamanders have replaced …hose using coke to some extent, al…hough the reverse trend is evident … the oil-rationed East. Lanterns …laced inside stovepipe or cardboard …orms for building columns have …armed the area prior to concrete …lacing. After placing of concrete, a …arrel set over both column and lan…ern kept the concrete from freezing.

Marine structures

Among the year's notable marine projects were ship construction basins, or submerged ways, as they are sometimes known, to distinguish them from deeper and more elaborate drydocks and graving docks. At one East Coast yard submerged ways were built with cellular, sheetpile cofferdams to serve as the permanent walls and the inshore end of the docks, a floating gate closing the outshore end. Only fill material available for the cells was a soft, water-saturated marl. Drainage and stabilization of the fill material was assisted by "sand piles" placed by driving an open pipe with its lower end closed by a loose tip and then filling the pipes with sand and gravel. As a final operation, the pipe is withdrawn, leaving the loose tip at the bottom, the sand and gravel being forced out by air pressure as the pipe rises.

On the Gulf Coast several basins at one yard have been constructed in a sandy clay by use of wellpoints to lower the groundwater level. The basins have 8-in. thick floors and a 5- to 8-in. thick wall reinforced by buttresses. Flotation is prevented and stresses on the wall kept low by continuous pumping of the wellpoint system.

Concrete ships are being built in the Gulf Coast basins, where the forms for the bottom of the hulls are fastened securely to the floor of the basins. The plan is to float the ships off the form as the basin fills. At this yard, vacuum processing of the concrete in the hull is used. Conventional mats are used inside on the bottom of the ship. The exterior forms for the sides of the ship are plywood, faced with expanded mesh, wire screen and non-waterproofed canvas to be used as the vacuum mat.

Ingenious "jackets", hollow boxes of concrete with the ends open, have been used over precast concrete piles on the West Coast. The jacket makes it unnecessary to cast individual piles to exact length or to cut them off at the cap level. The piles, which are driven a little short of required cap level, are brought to the elevation required by adding the jacket. The jacket also gives added size and protection through the tidewater range, most vulnerable point of any pile.

Protection for wood piles in the form of sand and cement sprayed on the piles by pneumatic pressure and held by mesh reinforcement has been successfully used. The protection was necessary because of marine borers at the site. The piles were successfully driven three days after placing the coating.

Structures for war

Big hangars of steel with a 328-ft. span and a 185-ft. rise were erected for the Navy by widely different methods. Harris Structural Steel Co. used a huge jumbo traveller, 200-ft. wide, 86-ft. long and 175-ft. high. This supported the arch framework during erection as well as two stiffleg derricks of 25-ton capacity. American Bridge Co. did a similar erection job with stiffleg derricks set on the tops of triangular towers 61 ft. on a side. Supplementing the erection towers were 110-ft. high movable falsework towers supporting the steel work during erection.

Corbetta Construction Co. devised an underground storage magazine for munitions that simplified some of the construction procedures and reduced metals and concrete far below requirements for the semi-cylindrical igloo. Known as the "beehive" it is built around a central pipe that supports a frame of bar-trusses to which are welded circumferencial steel rods. Welding is done from a frame carriage whose center rests on the central pipe while the outer end revolves on wheels on the extended base. Concrete is placed by use of the same carriage.

Power line poles at an army camp were set by supporting the poles vertically on pikes above the desired location while an explosive charge was detonated in the muck below the surface. The explosion opened a hole in the muck and raised the pole enough to release the pikes, permitting the pole to drop vertically. Inrushing mud held the pole in position.

Radial wells, pipes jacked at right

Coating of hot tar-enamel and spiral wound asbestos-felt protects this 24 in. dia. gasoline pipeline from corrosion for its full 1,250 miles from Texas to the East.

angles to the main opening were used to reduce the head of water surrounding the Brooklyn approach of the Battery-Brooklyn vehicular tunnel. This eliminated the necessity for operation under air pressure for part of the approach work and reduced the air pressure required for an additional distance.

The construction methods involved in stabilizing soil with cement underwent rapid development during the year, as large yardages were laid for airfield runways. Principal development was in the direction of increased mechanization, objectives being improvements in cement proportioning, in mixing efficiency and in speed. A Southwest airbase offered the best example of this mechanization. There, a long line of construction machines processed a 7 to 8 ft. wide lane completely from natural soil to final rolling in a single pass. Scarifying and pre-wetting was done the night before. In the train of processing equipment a 600-bag capacity bulk cement truck, drawing a mechanical, measuring distributor was first. Materials were picked up and dry mixed by a special "road-mix" machine mounted in the position of the blade on a patrol grader. A pressure distributor applied a measured amount of water, and was followed by another road-mix machine that left the material in a windrow. Patrol blades spread the windrow and it was compacted by sheepsfoot rollers, scarified and again compacted, followed by addition of a surface enrichment of cement and further rolling.

For emergency airfields, especially in "forward" areas, runways have been made by laying portable steel mats on a leveled area. Engineer troops of all branches of the services have put these mats to quick and efficient use.

Pipelines from Texas

"Big Inch," the largest fluid products pipeline ever built (24-in. dia.) is progressing eastward, pushed by the most modern methods thirteen veteran pipeline contractors can devise. Basic methods are those familiar to all pipeline constructors, but machines and operations are larger and more rapid than ever before.

A probable record for pipeline moving was established when 194 miles of an 8-in. dia. line was dug up in Texas and relaid across northern Florida. Ditchers, with buckets shaped to straddle the pipe, excavated the line. Relaying followed conventional methods.

Few heavy construction projects have continued through the year. Those that would not contribute materially to the war in the immediate future have been stopped to conserve material, equipment and manpower. One large project notable for rapid construction, however, is Douglas Dam of the Tennessee Valley Authority for which plans, machines, construction personnel and even permanent equipment were lifted bodily from the nearly completed Cherokee Dam and moved to the new work. Equipment, and the work trestle, from Friant Dam in California was also moved across the country to build Dale Hollow Dam on the Cumberland watershed. At Norfork Dam the cableway cycle was cut 2½ min. on concrete placing by hauling concrete part way in trucks, from which it was dumped into the cableway buckets. A belt conveyor was used to save a great deal of up- and down-hill hauling on Youghiogheny Dam. The latter three projects are being built for the Corps of Engineers of the Army.

New machines

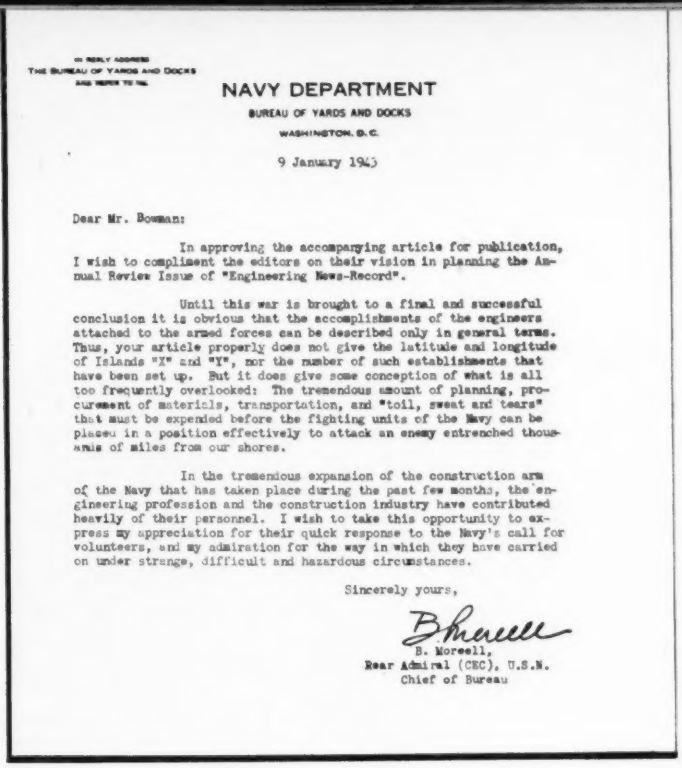
New equipment and new models of machines were not numerous last year. One notable development is a screw luffing device for booms on big cranes, eliminating the usual boom cables supported over an A-frame above the cab. The screw makes smoother handling and more accurate positioning of big loads possible. In addition, screw luffing may be safer, as it eliminates the possibility of a single frayed-strand of cable permitting a load to drop.

The bull-clam, a clam type lip on the front of a bull-dozer blade, makes a pick-and-carry machine of a tractor, enabling it to push up a "bite" then carry it clear of the ground. Hydraulic pistons force opening and closing of the clam.

And, adopted from the lumber industry, overhead pick-up load-carrying straddle-trucks have been widely used in prefabrication yards for both houses and ships. In some cases they carry loads for a mile or more, making rapid speed despite their top-heavy appearance.

A 30-ton capacity crane attachment for use with a cable controlled rubber-tired tractor has a long lifting arm and rapid travel speed with load. Designed for salvage of planes, it will be useful on construction work.

Navy Construction In Theaters of Operation



IN REPLY ADDRESS THE BUREAU OF YARDS AND DOCKS AND REFER TO NO.

NAVY DEPARTMENT
BUREAU OF YARDS AND DOCKS
WASHINGTON, D.C.

9 January 1943

Dear Mr. Bowman:

In approving the accompanying article for publication, I wish to compliment the editors on their vision in planning the Annual Review Issue of "Engineering News-Record".

Until this war is brought to a final and successful conclusion it is obvious that the accomplishments of the engineers attached to the armed forces can be described only in general terms. Thus, your article properly does not give the latitude and longitude of Islands "X" and "Y", nor the number of such establishments that have been set up. But it does give some conception of what is all too frequently overlooked: The tremendous amount of planning, procurement of materials, transportation, and "toil, sweat and tears" that must be expended before the fighting units of the Navy can be placed in a position effectively to attack an enemy entrenched thousands of miles from our shores.

In the tremendous expansion of the construction arm of the Navy that has taken place during the past few months, the engineering profession and the construction industry have contributed heavily of their personnel. I wish to take this opportunity to express my appreciation for their quick response to the Navy's call for volunteers, and my admiration for the way in which they have carried on under strange, difficult and hazardous circumstances.

Sincerely yours,

B. Moreell,
Rear Admiral (CEC), U.S.N.
Chief of Bureau

AT THE TIME of the Pearl Harbor attack, the construction industry was about 75 percent converted to building for war—constructing factories to produce tanks, planes and guns; planning and building cantonments, airfields, roads, bridges, shipbuilding ways, drydocks and other structures. Since that time—during 1942—the industry has mobilized 100 percent for building for war, and an important part of this mobilization has been concerned with meeting the construction requirements of the United States Navy.

Prior to Pearl Harbor all Navy construction was done by general contractors and their personnel. This method is still being used within the continental United States. But the loss of life and the capture of construction workers at Wake Island, Guam and Cavite illustrate the hazards of Navy work overseas. And since much of the work now being done, and to be done in the future, will be in locations where enemy gunfire may be expected the Navy has organized construction units known as Seabees, to handle "theater of operations" work. This was the significant development in Navy construction in 1942, and the one whose growth will bear watching in 1943.

Because of the vision displayed by the Navy Department in the long-range planning of our shore establishments, when war was only a shadow on the horizon, the United States Naval forces have been able to attain successes against the Japs in the Pacific and to cooperate with the North African expeditionary forces despite the losses and damage sustained during the sneak attack on Pearl Harbor. The Pacific fleet would have been impotent for any offensive or defensive action had there not been shore establishments or bases at its disposal for making the necessary repairs, remanning, outfitting and refueling, and the progress of the war toward victory would thereby have been long, perhaps fatally, delayed.

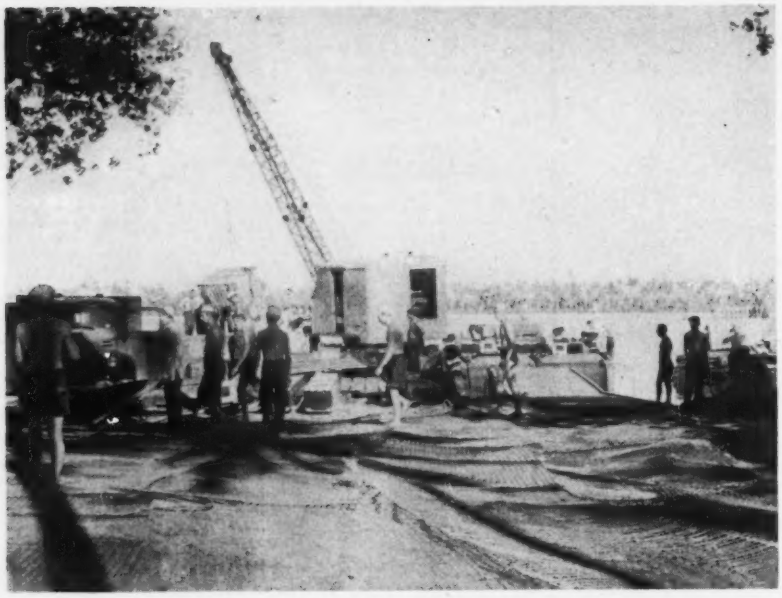
Bases require many facilities

The bases or shore establishments of the Navy, the construction and maintenance of which is the responsibility of the Bureau of Yards and Docks under the direction of its Chief, Rear Admiral Ben Moreell (CEC) USN, are in reality great industrial establishments. And the diverse facilities that they require suggest the variety of construction problems encountered. Among these facilities are huge drydocks, both fixed and floating, piers, wharves, ship-building ways, storehouses, hospitals, barracks, mess halls, laundries, telephone systems, transportation systems, power plants, radio facilities, water supply systems, railroads, airfields, highways and bridges.

It can readily be seen that the shore establishments of the Navy require vast expenditures for engineering and construction activities. The best illustration of the enormous size of the program of construction being accomplished in the present war is by actual expenditure figures. During the peak of the first World War the Bureau expended only $189,000,000 per year, while for this war the Bureau has now reached an expenditure of more than $250,000,000 per month, or approximately 2½ billion dollars per year.

Construction of this kind could be accomplished readily in normal times within the United States, where necessary materials are available, and where the Navy could draw upon the cooperation of engineers and construction men long accustomed to contracting for any kind of a construction job, from dams and graving docks to small reservoirs and storage tanks and from huge skyscrapers to small homes. Under present conditions it is far more difficult, and when the operations are being located on a small isolated tropical island or on a bleak, barren, rocky shore in the Arctic regions, and subject to enemy attack, the task becomes almost insurmountable. Yet these operations must be accomplished and in the shortest possible time.

The use of the term "a two-ocean Navy" is obsolete with our ships patrolling the seven seas. Wherever there



Wire mats stabilize a beach in the South Pacific to keep Seabees' cranes and trucks from bogging down while unloading landing barges.

Water supply system on a tropical island consists of this hillside rain collector surface discharging into buttressed concrete tanks.

is action, whether it be in a strictly naval engagement or an engagement occurring while our ships are engaged in convoy duty or in support of landing operations, damages sustained by our fighting craft require immediate and efficient attention. Hence wherever our fighting ships sail they must have a shore establishment not too far distant, in order that they may be repaired and serviced.

Nor is it only the fighting ships that require these base facilities. The merchant or auxiliary ship, upon which the transportation of vast stores of foods, clothing, ammunition, fuel, and equipment depends, must also be cared for. And finally, aircraft, like fighting ships, require bases for repairing and refueling; bases that in addition must provide runways for landing, hangars for storage, quarters for personnel and storage for ammunition.

More and more, these facilities were being located on foreign shores in 1942, and it may readily be assumed that the tempo of foreign work will increase in 1943. This work will be done by the Seabees whose personnel is drawn largely from the construction trades and whose officers are engineers who have been selected for their construction experience. Each battalion has carpenters, steel workers, concrete workers, riggers, mechanics, and other skilled workers as well as construction laborers in its ranks. Their personnel is recruited from both the white and negro races, and it has been noted that the negro units are making records that can be pointed to with pride by all Americans.

Setting up advance bases

As an example of the variety of problems encountered in advance base construction, a typical operational base on an island within range of enemy raiders may be cited. Men and material must be transported to the site and unloaded. There are no facilities for docking and handling the materials of construction or the equipment to be used in accomplishing the work. This condition makes imperative the construction of necessary mooring facilities, piers, roads and storage areas.

Following unloading and the construction of these basic facilities, shelters for the base personnel, including sleeping quarters, hospitals and dispensaries, messhalls and kitchens, and other structures such as storehouses, repair shops, power plants and cold storage plants are built. For protection, large runways for aircraft are necessary. Protected gasoline and fuel oil storage facilities are required, both for ships and for aircraft. Communication facilities are essential. To make these bases effective, it is easy to see that speed is of paramount importance. Rain or snow, cold or heat, the work must be continuously pushed.

Upon completion of a base, additional protection of the installation must be accomplished by camouflage, and the transportation of batteries of anti-aircraft guns to strategic locations must be undertaken. Gun mounts, of course, have to be constructed before artillery protection becomes effective. An example of the construction speed being accomplished by the Seabees in the establishment of bases is the report from the field of complete landing facilities for aircraft being placed in operation less than ten days after landing. And

Preparing a large area for parking and camouflage of planes at an extreme northerly base. Principal operation is removal of peat overburden and smoothing of surface, which is frozen and firm.

this particular airfield was literally hewn from the jungle.

Seebees go all over the world

The men accomplishing these wonders of construction on foreign shores are, as stated before, recruited from the construction industry, and are given an intensive training. This training includes familiarization with the types of construction machinery and equipment they may be called upon to operate, as well as military combat exercises.

Immediately following this basic training, units embark for all parts of the world where fighting fronts may be established, whether it be in Iceland, Alaska, the South Pacific, Australia, Africa, Europe or Asia. Wherever they land, the work immediately proceeds, and soon established bases take shape and are made ready for the huge task of servicing the fleet or the aircraft.

A unit landing on Island X, for example, has the problem of building harbor facilities for unloading supplies. Wharves and landing piers are constructed, a job involving the fashioning of piles from tropical trees and driving them with quickly constructed rigs, despite the fact that they must be seated in a coral rock formation. In the meantime pontoon floats are joined together to form a floating pier.

While the piers are being constructed, lighterage units are made up from similar pontoon floats and, as equipment is landed, the task of providing roadways, water purification units, storage areas and shelters, personnel structures, hospitals, machine shops, and all other like facilities is rushed with the speed born of the knowledge that time is the essential element for protection of the area and other areas in the proximity of Island X.

The same speed and efficiency is shown in the establishment of an advance base on Island Y, a bleak, rocky island of the Arctic region. Here, however, conditions are far different from those encountered on Island X and outlined above.

There are no forests to provide timbers for construction purposes and, too, subsoil and foundation conditions present an entirely different problem. More of the materials have to be brought in, and weather protection for personnel increases in urgency. Otherwise, the same structures and facilities have to be provided as were required on Island X. This, too, is an industrial plant capable of making repairs and keeping in operation the nation's fighting units on the water, under the water, on land and in the air.

Whether on islands or on foreign mainland, the Navy construction men, while primarily builders of operational bases, may also be called upon to drop their implements of construction and form into efficient fighting units for the defense of the works they are charged with accomplishing. The promise for 1943, is, therefore, more Navy construction outside the United States, and the probability of fighting interspersed with building.

Bomb craters on Guadalcanal's Henderson Field signalized a job for the Navy's Seabees shortly after the Marines took over this Jap-built base.

CONSTRUCTION OVERSEAS

Sanitation in Latin-America

Gordon M. Fair

Professor of Sanitary Engineering, Harvard University, and Consultant to the Division of Public Health and Sanitation, Office of Inter-American Affairs

IN THE COURSE of a 15,000-mile trip through the countries of South and Central America during the summer of 1942, in the interests of the Division of Health and Sanitation of the Office of Inter-American Affairs, the writer was greatly impressed with the magnitude and variety of the sanitary problems that confront these countries. But even more impressive was the depth and sincerity of the desire of their peoples for the sanitation of their environment as well as the determination of their governments for constructing the necessary sanitary works.

No doubt was left in the writer's mind that the Latin-American countries are experiencing a "sanitary awakening" which, like its forerunners in the other democracies, is the result of an aroused social conscience. In these circumstances, sanitation has become an integral part of broad national plans which include in addition to sanitation: Social security legislation, hospitalization, medical and nursing care, housing, nutrition, and public health education. The success of such plans, we know, is dependent ultimately upon the availability within the country of adequate numbers of technically qualified medical, engineering, and nursing practitioners who are devoted to their people and to their cause in public health.

Early health and sanitary aid

The first steps for the provision of public health personnel in Latin-American countries were aided many years ago by the International Health Division of the Rockefeller Foundation. For almost a generation, this organization has been demonstrating, in these countries, the social desirability of sanitary projects and their economic feasibility. Furthermore, it has been sending some of the best medical, engineering, and nursing talent of the cooperating countries to the United States for the study and observation of public health and sanitary engineering in the schools and governmental health agencies of this country.

Of late years the Pan-American Sanitary Bureau has supported similar educational projects and has carried the message of hemispheric health to all the Americas. The visitor to South and Central America should not be surprised, therefore, to encounter in his travels groups of English-speaking public health workers who count among their numbers some of the keenest minds within the writer's professional acquaintance.

Gordon M. Fair is one of the world's outstanding interpreters of public health and sanitation practice. Born in South Africa and educated in European schools as well as in this country, one of his earliest assignments was assistant director of sanitation, League of Red Cross Societies, in Geneva. Since 1922 he has been on the faculty at Harvard University, and his courses in the graduate school of engineering have been the rendezvous of students from the far corners of the globe. In the field of water and sewage treatment research, he has likewise distinguished himself. His selection as consultant to the Office of Inter-American Affairs brings to that post a man of broad vision and practical knowledge of sanitation on an international scale.

The social status of the professional engineer in Latin-America is high. By courtesy, he receives the doctor's title, but he prefers to be called "Engineer." The head of at least one of the great republics of South America —Peru—is an engineer by training and experience. Schools of engineering are established in almost all of the republics, and most of them are well housed and staffed. Many of the instructors are recruited from the offices of governmental engineering agencies.

The libraries of the schools of engineering were filled formerly very largely with French text and reference books. Today these volumes are being relegated to the less accessible shelves of the libraries in order to make room for American works on engineering. There is associated with this reorientation of studies—from the algebraic solution of engineering problems so characteristic of the French to the arithmetic attack preferred by engineers in this country—the development of a practical point of view which is exerting an important influence both upon the thinking and the activities of engineers in Latin-America.

Closer engineering cooperation

This change, together with the facilities of air travel, is bound to bring the engineers of the Americas into closer fellowship and understanding and to open the way for ever greater exchange of engineering personnel and experience. At the same time there is imposed upon us the duty to make our books and periodicals more

ly available to Latin-American neers by distribution of our pub-tions at prices that are adjusted to purchasing power of these engi-s and by translations of particu-important works into Spanish Portuguese.

Wartime cooperative efforts

In January, 1942, a month after entrance into the war, the foreign isters of the 21 American repub-met in Rio de Janeiro and formu-d a many-sided program of co-ration for: (1) the development the economic resources of this isphere; (2) the control of anti-erican activities in the American ublics; and (3) the defense of the ericas.

The conference proposed in par-lar that the American republics e individually, or through agree-nts between two or more of them, propriate steps to deal with prob-s of public health and sanitation. e conference suggested that such perative action be undertaken in cordance with the ability of the sep-le countries to provide raw mate-ls, services, and funds.

The urgency of the program be-me evident after the loss of Singa-re, the Dutch East Indies, and the ilippines. In these Far Eastern ions, the United Nations lost their incipal sources of rubber, manila mp, quinine, and tin, and substan-l supplies of other metals, vege-le oils, and other vital materials ny of which, fortunately, could be oduced in part or wholly within our n hemisphere.

A tremendous job of organization s involved in exploiting hemispher-l resources. The Rio conference ovided the framework for coopera-on in this organization of hemi-herical resources to produce sup-ies needed by the war industries of e United Nations and to replace aterials lost to the Japs in the Far ast.

Success in this program was predi-ted upon adequate protection of e workers in tropical areas against e hazards of their environment. e necessary health and sanitation ork had to be undertaken immedi-tely, for it had to precede as well as company economic developments. ealth and sanitation measures were eeded, furthermore, in connection ith defense projects. Altogether ese requirements created a formid-

Fig. 1. A sanitary fill for refuse disposal at Quito, Ecuador. The fill is being made above a collector sewer recently installed in one of the many deep gullies that traverse the city.

able task of health and sanitation planning.

Considering (1) the expense, (2) the close cooperation called for among the governments of the Americas, and (3) the urgency of the work, this program inevitably became a government undertaking. To carry out the Washington end of the program, there was set up, in the Office of Inter-American Affairs, a Division of Health and Sanitation, and the Surgeon General, U. S. Army, assigned to this division, as its director, Gen. George C. Dunham of the Army Medical Corps. At one time adviser on public health to the Philippine Government, General Dunham is also an authority on problems of health and sanitation in South America.

Then the Institute of Inter-American Affairs was formed as a corporate medium for the program of health and sanitation, and an agreement was reached with the Surgeon General, U. S. Army, permitting the assignment of a limited number of officers from the Medical Corps and the Sanitary Corps to duty with the Institute. Nelson A. Rockefeller, Coordinator of Inter-American Affairs, became president of the Institute which utilizes civilian personnel as well as the military personnel already mentioned, to carry on its far-flung activities.

The first American field party, including a physician, an engineer, a business manager, a disbursing officer and a lawyer, was assembled in Washington, in February, 1942, inoculated against typhoid fever, yellow fever, tetanus, and typhus fever; vaccinated against small pox; instructed in government procedures; and dispatched to Ecuador during the first week of March. The North American technical personnel of this party has since more than doubled in strength, and many Ecuadorian physicians, engineers, and architects have been added to the party.

Program of field work begun

At the present time, agreements to carry on health and sanitary work have been signed between the United States of North America and a dozen Latin-American republics, and field parties have been sent to all of these countries. New agreements are in the making and we may look forward to the eventual realization of all the recommendations of the Rio Conference.

The work done by the cooperative services, named in most countries the "Servicio Cooperativo Inter-Americano de Salud Publica," is varied and depends largely upon the problems, needs, and desires of the cooperating republics and upon the materials available for the construction of required sanitary works. The following types of projects are common:

Construction or rehabilitation of water supplies.

Construction or extension of sewerage systems.

Construction of malaria drainage systems and operation of malaria control projects.

Construction, completion, or rehabilitation of hospitals, dispensaries, and health centers.

Education of medical, nursing, and engineering personnel.

Education of the public in health.

Operation and support of hospitals, health centers, and dispensaries for the care of workers employed in the development of strategic materials.

About 50 United States physicians and engineers are engaged in this work at the present time, and the corresponding number of Latin-Americans is many times that figure.

Rubber depends on malaria control

Perhaps the most spectacular cooperative enterprise in Latin-America is the public health program in the Amazon Valley. The cooperative services in this vast area involve the republics of Peru, Bolivia, Colombia, Venezuela, and Brazil. Rubber is the most immediately important product of this river realm which, unfortunately, is defended against needed exploitation and development by the mosquito vectors of yellow fever, malaria, and other tropical diseases. Most difficult to control, among these, is malaria.

Workers can be protected against yellow fever by inoculation, and the tropical diseases other than malaria are unusual and acquired generally only after prolonged exposure. But against malaria there is as yet no means of protection by artificial immunization, and the attack upon this killing and debilitating disease must be by destroying or controlling the mosquitoes that spread it. It is in this connection that engineering methods prove their worth.

In the Brazilian reaches of the Amazon and its tributaries, the cooperative health service inherited a ready-made malaria control organization from the Brazilian Government and the International Health Division of the Rockefeller Foundation. The "Malaria-Control Service of the North East" had just completed—two years earlier than expected—the hitherto unknown feat of wiping out, to the last female, a malaria-carrying species of mosquito, *Anopheles gambiae*, believed to have been conveyed to northeastern Brazil by fast French gunboats or planes from Dakar in West Africa.

This Gambia mosquito had ravaged the invaded areas because of its own great susceptibility to malaria and its high degree of domestication. Thousands of people had died of malaria in the worst epidemic on record in Brazil. Yet within two years, the concentrated efforts of the Malaria Service of the Northeast had destroyed every Gambia mosquito in Brazil. Most of this group of physicians, engineers, and field workers was assigned to the Amazon project by the Brazilian government together with all of the equipment employed by them in their extraordinary feat.

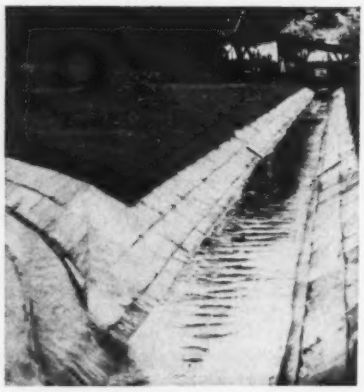


Fig. 2. Malaria control channel and drop lateral draining seepage swampland at San Miguel, El Salvador. The residual drainage supplies clear water to a public laundry shown in the far background.

Fig. 3. Masonry collector sewer on which a brick arch top is to be installed at Quito. This is a good illustration of how local materials are being employed.

The job ahead

While there is no expectation of accomplishing in the vastness of the Amazon Basin anything as completely successful as the work of the Gambia Service—so called—there are hopes of holding malaria sufficiently in check to bring out increased quantities of rubber and to permit the resettlement of the Amazon Valley without which there can be no true or lasting progress in this vast, fertile region. In this connection the Brazilian Government is planning to move about 600,000 people from drought-stricken and unpromising regions into the Amazon Valley.

Every means known to man for the control and treatment of malaria will be employed. In the larger communities drainage and diking projects are under way to eliminate mosquito-breeding areas. Here, too, hospitals for the care of rubber workers are being built. In the smaller communities, larvicidal measures are being instituted, and dispensaries are being constructed. Advanced posts are being equipped for first-aid to the workers, and boats—Diesel engine-driven on the larger waterways and powered by outboard motors on the shallow headwaters—carry medical relief into the rubber-producing areas.

General sanitation, of course, must accompany malaria control work. Water has to be supplied to communities, in particular to hospitals and dispensaries, and the wastes from homes and institutions have to be removed in sanitary fashion.

Projects similar to this one, but on a smaller scale, are under way in other regions of the Americas, intended, wherever possible, to aid the war effort of the United Nations by initiating or increasing the production of vital materials or by reducing the hazards of disease in strategic areas.

CONSTRUCTION OVERSEAS

Army Engineer Work In Foreign Fields

ADDRESS REPLY TO CHIEF OF ENGINEERS, U. S. ARMY WASHINGTON, D.C.

REFER TO FILE NO. _____

WAR DEPARTMENT
OFFICE OF THE CHIEF OF ENGINEERS
WASHINGTON

January 15, 1943.

Dear Mr. Bowman:

I am happy to approve the accompanying article for publication in your forthcoming annual review issue.

In every war that this nation has waged American engineers have worked and fought in the front lines - but never before in our history have there been so many far-flung front lines. And the American people are just beginning to learn how the engineers have made ready the defensive ramparts of democracy. Our military and naval operations in North Africa, the South Pacific, and the Aleutians are proving that all members of the combat team must be completely coordinated - and demonstrating anew that the engineers are an elite member of the team.

Besides the combat engineering projects throughout the world there is the vital construction project just completed - the 1500 mile military highway ripped across Canada and Alaska by the Corps of Engineers. Over this road, which brings Tokyo 4000 miles nearer than by way of San Francisco and Honolulu, supply trucks are now rolling northward.

The accompanying article and photographs indicate the tremendous volume of "off shore" construction since our defense system began to expand - and they emphasize the magnificent part played in the job by the engineering profession and the construction industry.

Sincerely,

[signature]
Major General,
Chief of Engineers.

THE YEAR JUST PAST has witnessed a transition from the war preparation period to actual offensive warfare. Backed by the spirit of Bataan and the gigantic industrial potential now blossoming into full strength, American military forces are fast moving into this new phase of action. And no branch of the service is more affected by these events than the Corps of Engineers. It is not so much a change of pace as a change of emphasis that has occurred—from building training camps and bases at home or on nearby shores to the construction of bases and military engineering facilities in actual war zones scattered all over the world. A review of how this change of emphasis has occurred will give some insight into the type and magnitude of the job that lies ahead.

When, in the late 30's, it became more and more evident that the United States might be involved in what could swiftly develop into global warfare, it was entirely natural that the first action of our planners was to look to our own defenses. As a result, we embarked upon a tremendous construction program in the continental United States. Simultaneously, expansion was commenced of facilities in Alaska, Hawaii, the Panama Canal Zone, Puerto Rico, and others of our off-shore possessions. In January, 1941, work was started on the Atlantic bases leased from Great Britain. This was a very large program, involving construction of permanent housing, temporary housing, airfields, fortifications and miscellaneous technical facilities. With the approach of war, this program was accelerated and expanded to include additional bases in the Caribbean area, while in July, 1941, work was started on the construction of facilities in Greenland for air operations and housing of defense forces.

Airfields on ferry routes

With the almost certain approach of hostilities in late 1941, efforts were directed toward construction of supply routes to our own overseas possessions and to others of the Allied Nations. The first of these provided a chain of airfields for delivery of airplanes from the United States to the Philippine Islands, Australia, and other islands in the South Pacific. No effort was spared in putting this route through in record time. Late in 1941, also, attention was given to construction of ferry routes through the North and South Atlantic Ocean. Under this program, the facilities in Greenland were greatly expanded. Existing airfields in Iceland were enlarged and additional ones constructed, while the assistance of the Canadian government was obtained in extending this route through parts of Canada.

Plans were also developed rapidly for expansion of facilities in the northeast portion of South America, to provide for the ferrying of aircraft through this area to Africa. Work was likewise started in the Red Sea area, and in Iran and Iraq, to develop ports and rail and highway transportation facilities for delivery of miscellaneous supplies to other Allied Nations in this part of the world.

Early in 1942, as a result of an increase in quantities of planes and miscellaneous other materials to be delivered to other parts of the world, further expansion of the supply routes through Canada, South America and Africa was initiated. This expansion included construction of the Alcan Highway and a number of airfields along the route of this highway. Large quantities of construction materials were delivered into parts of Canada and Greenland that could only be reached by water transportation during approximately three months of the year.

In the development of the above programs, from the late 30's until the present time, construction problems of almost every variety have been encountered. Airfields have been constructed of all sizes, from single flight strips, 100 ft. wide and 3500 ft. long, to paved runways 200 ft. wide and 7000 ft. long, capable of handling the heaviest military planes under consideration.

Some of these ferry route airfields were merely graded and permitted to freeze. Others were graded and paved

Engineers troops in the Southwest Pacific lay a steel mat landing strip on an airfield that has been cleared in the jungle. Advantages of such a surface are that it can be speedily installed and easily repaired if bombed.

with steel mats developed for construction of emergency runways. Others were constructed by placing heavy wearing courses over existing runways built for less frequent operation of planes, while others were of asphalt or concrete, similar to those constructed in the United States.

Housing has varied from the simple wooden structures used in theatres of operations, to brick and tile structures of native materials in South America, and well-designed permanent structures on the bases leased from Great Britain. Housing constructed in the areas adjacent to the Arctic Circle is of special design, with plenty of insulation, vestibules, storm windows, etc.

Caribbean work slowed down

Although some of the housing on the bases leased from the British for a 99-yr. period is of permanent construction, this work was stopped soon after the United States entered the war, and further construction was limited to the bare necessities. Inasmuch as most of the off-shore bases are constructed in out-of-the-way places, each project involved construction, also, of docks, roads and miscellaneous storage facilities.

Unusually diverse conditions were encountered in the carrying out of all of this work abroad. Unloading of cargo, in many instances, was accomplished by moving small lighters from ships to beach. Temperatures ranged from the extreme lows north of the Arctic Circle to the extreme highs in the deserts of North Africa and Iran. Tropical rains and tropical diseases caused the usual difficulties, also, in connection with work in the vicinity of the equator.

More work abroad

It may be assumed that as the Allied Nations' offensive gains in intensity, a large volume of additional construction work will be undertaken in the overseas theatres. Most of this work must, of necessity, be accomplished with regular troop units whose personnel and officers are drawn in large numbers from the ranks of civilian civil engineers and construction men. Here are mirrored two basic changes in the construction pattern of 1942 and 1943—the industry is in uniform, and many of its activities and responsibilities are transferred to foreign shores.

Even from the foregoing necessarily brief outline, it readily can be realized that the Army Engineer is among the most versatile of soldiers. He must have much of the basic knowledge of the infantryman; he must understand every phase of warfare; he must be prepared to come to grips with the enemy in combat; he must establish bridgeheads under fire, or landings on hostile shores, or demolish an existing bridge, or throw up or destroy defenses in the midst of battle. He must also improvise safe and adequate landing fields in virgin territory, and he must be able to provide housing, water and utilities for thousands of fighting men, whether in desert, jungle or arctic waste.

In time of war, a detailed description of the construction work of the Corps of Engineers is an accurate index of the military plans of the armed forces, particularly with respect to overseas activities. The wide scope of planning and work required may be illustrated by a brief outline of a case which, although hypothetical, is based upon a combination of a number of actual instances.

Building a typical base

The location was a small volcanic island in a tropical zone, having no timber and no water. A reconnaissance survey had been made by engineers assigned to the Air Forces, and a contoured sketch may was available. Shoal conditions about the island were such that cargo discharge had to be by lighter, and the surf and swell were so heavy that only decked lighters could get through.

However, the island was selected as an Air Transport Command ferrying station, and the ultimate occupying force was to be the Air Force service personnel, plus a protective force, together with the other necessary services.

The Engineer mission was to precede the permanent force and to accomplish the following:

Discharge engineer troops and cargo.

Improve shore and dock facilities.

Erect tentage (with floors) and accessory housing for the construction force and its services and supplies.

Install and operate salt-water distillation units to supply 5 gal. of water per man per day.

Construct approximately 7 miles of road.

Construct a bituminous-surfaced runway—7500 ft. by 200 ft.—with accessory taxiways, dispersion stalls, hangars, shops, etc.

Construct welded storage tanks for a large quantity of gasoline.

Construct 1500 ft. of 8-in. submarine gasoline pipeline, for bulk discharge from tanker to shore.

Construct several miles of 4-in. gasoline pipeline, from shore storage to airdrome.

Construct 1 mile of salt water pipeline to provide water for runway construction.

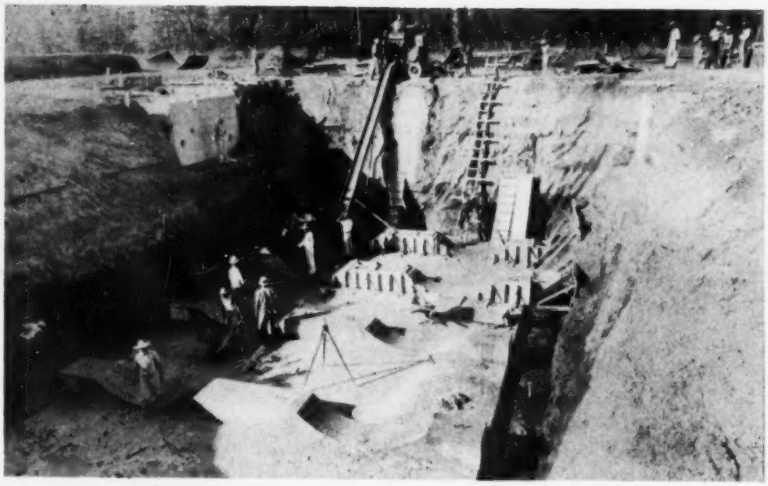
Construct theatre-of-operations housing for the permanent force, including barracks, messhalls, warehouses, baths, latrines, recreation and administrative buildings, etc.

Provide for the installation and operation of radio communication with the United States.

Provide a detachment to remain with the permanent force, to maintain the airdrome, operate the water distillation units, etc.

Maintain security and protection during construction.

In carrying out this mission successfully a variety of problems had to be solved. Thus, to meet the specialized problem of erecting over 3,000,000 gal. of tank storage, it was necessary, through the facilties of the machine records unit of the Adjutant General's Office, to comb the Army to secure a small crew of highly qualified tank welders.



Fuel tanks must be buried for concealment and protection. These concrete cradles will support 50,000 gal. tanks at an Atlantic outpost field.

Likewise the special water evaporation apparatus had to be procured and the operators trained in its use. Special lighters designed to meet the extreme surf conditions had to be obtained and a detail trained to operate them. Priorities for the procurement of the required tankage, pumps and pipe constituted another problem of the planning force.

After arrival on the site, soil samples had to be analyzed to determine the proper bituminous treatment for surfacing the runways. Finally came the inevitable problem of arranging for transportation by air of machine parts vitally needed and not available for shipment with the initial movement.

The total cubage of the construction task force, including personnel, equipment and materials was about 60,000 ship tons. The construction, which was completed in about one hundred days, represented an operation which if carried out by normal contracting methods and with civilian labor would have been ranked as about a $5,000,000 project.

In conclusion, this might be said—the work of the Corps of Engineers, here and abroad, in or out of combat zones, goes and will go steadily forward, and at an ever-increasing pace. It is a job of which the American construction industry may be proud, indeed one to which it is contributing hugely in personnel, brains and machines.

Troop housing in the far North consists of insulated and heated Nissen huts. Engineer troops are filling chuck holes in the roadway. The frame building in background is not identified.

CONSTRUCTION OVERSEAS

American Airbases Across Africa

E. R. Littler and W. A. Creamer

Chief Engineer and Assistant Chief Engineer, Pan American Airways-Africa

WHAT IS CONSIDERED the largest transport job ever undertaken by an airline was the establishment by Pan American Airways System in 1941-42 of the 8,500-mi. trans-Africa airline extending into Asia. As announced by President Roosevelt Aug. 18, 1941, Pan American Airways was assigned by the United States Government to set up and keep in operation such a route. The peculiar technical and engineering problems involved were many—in short, it was necessary to organize and transport to Africa a complete trans-continental airway. The necessity for such an airline was obvious; fighting planes were needed in the shortest time possible for the North African war fronts, a connecting link with India and China was required, and military and diplomatic missions for Russia had to be assured of the quickest and safest route possible.

The first step was the establishment in New York of a general technical staff. These men headed the various departments required, including operations, traffic, maintenance, communications, construction, meteorology, medical, commissary, and auditing. To this staff was assigned 100 key men from P.A.A. bases in Brownsville, Texas, Hawaii, the Philippines, and other points. With the staff heads these men formed the nucleus around which an operating force of 1,200 men was gathered and sent to Africa.

Meanwhile, a survey flight over the entire route was made by a group of airline officials and engineers. This group decided on the location of the main and intermediate stops to be established and, by consultation with local authorities, secured data on local facilities, utilities and materials available.

The survey flight revealed that there were small scattered airfields along most of the proposed route; these fields were used by the British in flying small commercial planes on an intermittent schedule. Thus, the problem resolved itself into enlarging and improving these existing fields for modern, efficient operation of many large and small planes. It also was necessary to establish the required facilities for maintenance of the aircraft, and to provide housing for the crews, station personnel and passengers.

From the data obtained from the preliminary survey, plans were drawn and material ordered in New York for the needed facilities and construction. Required personnel to construct and operate these facilities were engaged and transported to their jobs; some went by boat, but the greater number by plane. Considering the limited time available, the organization, purchasing and shipping problems involved at first seemed almost insurmountable.

Hangars built of steel

At the main stations on the line steel hangars were built with materials shipped from the United States. These structures are probably as modern as any hangars built today. They have a 120-ft. clear span and are 160 ft. long with a 40-ft. wide lean-to on either side. The hangars are equipped throughout with hand and electric hoists and cranes, fluorescent lighting, power and air outlets. In the lean-tos on either side are numerous shops for propellor, instrument and sheet metal work, and the repair rooms are equipped with the latest machinery for all kinds of overhaul and maintenance operations. At intermediate stops, prefabricated metal shops measuring 30x80 ft. were erected for repair and maintenance work of an emergency nature.

Solving tough engineering problems are taken in stride by Ellsworth R. Littler and Wilcox A. Creamer. Following graduation from Yale in 1924, Mr. Littler worked on pipeline construction in Colorado and later was in charge of maintenance and construction for a large eastern firm. Mr. Creamer, a graduate of Columbia, has designed sugar mills in Cuba, worked as a consultant, and for 10 years headed his own construction company.

Constructing the runways

Most of the runways were constructed from local materials. For many fields laterite or jigglin, which is a red, ferruginous porous clay, was used. Fortunately this material under proper rolling, water treatment, and sealing with hot asphalt sprayed on makes a very stable base. A large amount of the runway work was done by thousands of natives using headpans and shovels. Working patiently under native headmen and supervised by American foremen, the natives made a good record.

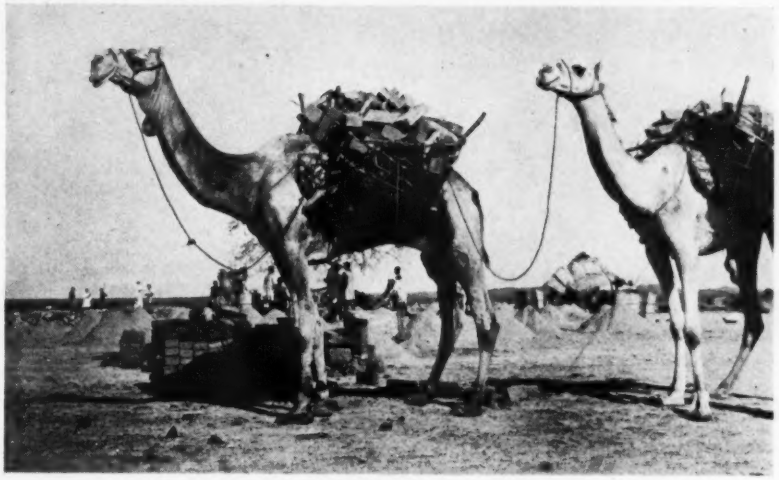
At some bases crawler tractors equipped with rooters, plows, bulldozers and other attachments were used. All of this equipment, plus trucks, sedans, fuel tanks, electrical equipment, as well as the structural steel, was shipped from the United States. Delivery of these supplies not only required that the equipment be obtained, but that shipping arrangements be made and that cargo space be found for nearly 10,000 items.

Modern plumbing materials also were needed and these supplies were purchased in the United States; local British residents had warned of the danger from malaria and dysentery and the need for modern sanitation. Thus, early in the program, paint drums, reels of cable, 100 huge fuel tanks, 1,000 cases of electrical equipment, and 5,000 bundles of structural steel had to be gotten aboard ship and transported safely to some one of a dozen bases thousands of miles across the Atlantic. Once the line was established, this flow of goods had to be maintained in spite of enemy action. The commissary department, previously mentioned, likewise had to purchase and provide for the transportation of most of the food required and for delivery of household equipment, bedding and linens.

Upon arrival at a port the material had to be sorted and forwarded to one of the numerous locations. Many of these items had to be shipped to a rail head almost 1,000 miles inland and from there by truck several hundred miles farther.

Transporting much of the hangar steel over the railroads and local motor roads with their sharp curves and low clearances was a difficult task. The transportation problems were overcome by building special bolsters on the railroad cars and by careful routing of the motor trucks through the narrow streets of the native villages.

When steel for the hangars arrived at an airbase, it was accompanied by complete erecting equipment. In most cases erection was by use of the hoists on two crawler tractors, the tractor engines furnishing the power for operation of the steel derricks.



In constructing the African airbases local materials, labor and transportation facilities were used extensively. On this job brick manufactured by native methods were employed in constructing housing for personnel.

Material for manufacturing brick locally was mixed by shovel with the water delivered by donkeys. The brick were sun dried after being molded by hand.

Layout of camps

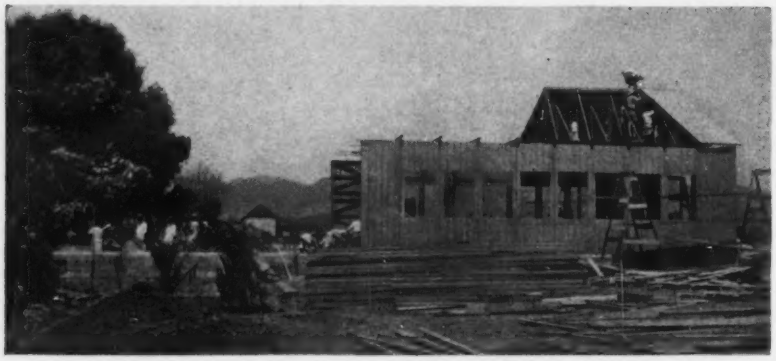
The layout and location of each camp to provide good living quarters proved an individual problem to be solved at each site. Where possible, an elevated location was selected and the buildings placed broadside to the prevailing winds. This arrangement was to provide each room with cross ventilation where possible, as the heat was a major consideration. Both British and American medical practice required that the camps be separated from local native quarters by certain minimum distances. This precaution was taken in order to reduce as much as possible trouble from malaria and dysentery. Of course, sewage disposal and water supply requirements were major problems to be considered in determining the camp locations.

Various types of living quarters were constructed, depending on the availability of local materials. All living quarters were screened and the entrances equipped with mosquito traps. Where local lumber was scarce, prefabricated houses were sent from the United States. The lumber in these structures was treated for protection against termites. In spite of adverse predictions by resident British, these houses are still proving very satisfactory after a year of service, and promise many more years of use.

When cement was available, a concrete floor slab was first constructed. On this slab was built concrete-block walls followed by a wood roof frame, 1-in. thick sheathing and a composition roof. This construction required considerable lumber and, fortunately, at numerous camps several types of hardwood were available, the most plentiful of which was mahogany. Needless to say, it broke more than one American heart to build a chicken abattoir out of mahogany.

Local saw mills supply lumber

In several of the larger cities there were small saw mills, which often were hard put to meet the requirements for dimension lumber. These mills were supplemented by supplies trucked to the site from small mills 40 to 100 miles out in the "bush." At these smaller mills three natives would first buy a single tree 60 ft. or more high and 3 ft. or greater in diameter at the base. Next they would fell the tree, cut it into 12-ft. lengths,



At many airfields maintenance buildings were constructed of prefabricated units manufactured in the United States. Local labor directed by native headmen and American foremen soon became sufficiently skilled to erect these structures at a rapid rate.

and after rolling each length over a pit dug alongside the middle of the fallen tree, saw the entire tree into 10x12-in. sticks. Finally as required, the material was cut into 1x12-in. boards. Sawing was done by hand with a two-man saw, while a third worker spent his time sharpening a spare saw. This method of preparing lumber has been used by the natives for the past many years.

Native carpenters do good work

Door and window frames, plank doors and louver-windows, which were largely used instead of glass, had to be constructed by hand at a temporary carpenter shop adjacent to each job. This work was done by native carpenters, who proved to be surprisingly skillful although slow.

Homes of the type just described were provided generally, but at a few locations cruder structures were constructed. At these places mud brick or local burned brick was used for the walls, and straw thatch as roofing. For a minor number of sites brick made from mud mixed with chopped straw and camel dung was used for the side walls, and the roof was built of poles covered with straw mats and reeds.

Generating systems were installed at all bases, and the buildings wired for electricity. Buildings, without plumbing or electrical equipment, cost on an average of 10 to 12c. per cu.ft.

At some stations local water systems were used, supplemented with booster pumps. For other locations water was secured from wells. The water was treated with American-made equipment, including pumps, pressure filters, and automatic chlorinators.

Modern lavatories, showers and flush toilets were installed at the stations. Sanitary disposal of sewage was provided by the use of septic tanks and tile fields at each building. In locations where the soil did not permit proper percolation, cast-in-place sewers were laid to a central septic tank installation where proper seepage conditions could be obtained.

At the main bases, four 10,000-cu. ft. prefabricated refrigerators were installed with units capable of creating 10 and 35 deg. F. temperatures. These structures were to permit storage of fruit and vegetables. At all other stations, walk-in, reach-in and domestic-type refrigerators were used.

Creosoted radio masts were brought from the United States, and radio buildings were erected. High powered radio equipment and direction finders were installed at all stations.

For the construction just described unskilled labor was obtained in some of the intermediate stations at rates as low as 25c. per day for common labor and up to 90c. for skilled labor. Local materials, including lumber and cement, were high in cost. Electrical equipment, pumps, pipe, nails and roofing were almost unavailable locally.

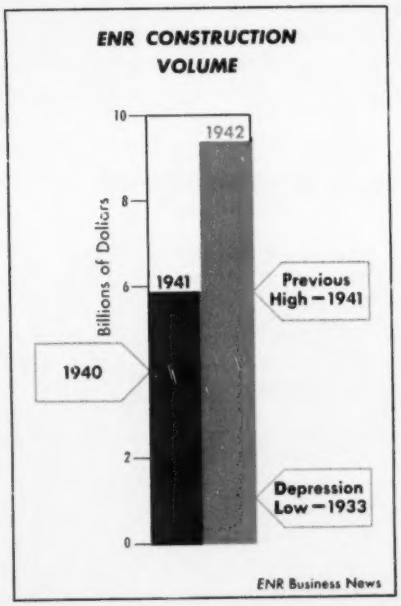
Since its establishment, the route constructed has had an unusually good operations and safety record. Its efficiency basis has been rated the equal of any airline in the world. One month after construction began, planes were flying the route and, before the end of October, 1941, the first scheduled flight was completed. Last fall, the corporation began to be absorbed by the Army's Air Transport Command, a process still continuing. As of this time, new construction, and most of the maintenance, is in the hands of the Transport Command.

Franklin Gledhill, general manager, P.A.A.-Africa, and Ellsworth N. Littler, chief engineer for the same organization, were in charge of the entire project.

Foundations for the structures required at one site were constructed with concrete mixed by hand and delivered by wheelbarrow. Concrete block was used for the walls of the buildings.

War Construction Records

The American construction industry prepared for war all over the world in 1942. Seabees and Army combat units on the fighting fronts and United States contractors at territorial and foreign bases ☆ handled an unprecedented volume of construction outside of United States that is not measured in the statistics. On the home front alone engineering construction totaled $9.3 billions, topped the 1941 high by 56 percent, and scored the ninth consecutive year of gains. For full report see following pages . . . . . .



ESTIMATED TOTAL VOLUME • ENR REPORTED TOTAL • RESIDENTIAL BUILDING FINANCING • EMPLOYMENT AND MATERIALS • COSTS • LABOR RATES • MATERIAL PRICES

War Year's Heavy Engineering Volume 56 Percent Above Defense Record

AMERICAN ENGINEERS and contractors in 1942 produced a record volume of heavy engineering construction that accounted for $9,300,000,000 out of an estimated total for all construction of $12,821,000,000. The increase in engineering construction over the previous year was 56 percent, compared with a gain in overall construction of 12.5 percent.

Neither of these figures includes the construction on the fighting fronts or on bases outside the continental United States where construction combat units and American contractors greatly increased their activities. Preparation for this combat and defense construction was of such magnitude, however, that 85 percent of the year's supply of new construction equipment was diverted to it.

Of the $12,821,000,000 estimated total of all United States construction almost 88 percent was for war projects, both publicly and privately financed. Federal volume, $10,350,000,000, gained 95 percent over last year's high, and made up 81 percent of the 1942 estimated total. It brought the public construction total to $11,061,000,000, a new record, 54 percent above 1941, despite the 63 percent drop in state and municipal.

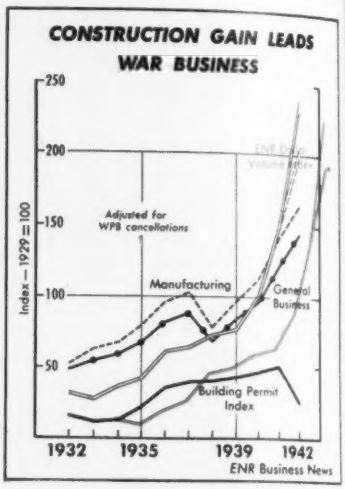
Estimated private construction, $1,760,000,000, declined 58 percent from a year ago, as both private engineering and private residential work fell sharply.

The engineering construction gain, which boosted *ENR* dollar volume 56 percent, also raised the *ENR* Physical Volume Index 47 percent above 1941. However, if all the construction work ordered halted by WPB is taken into consideration, these gains are cut to an estimated 46 percent for dollar volume, and 38 percent for physical volume. The work-stoppage volume, announced at $1,200,000,000, represents total original contract value of the projects halted, and thus includes that completed before the shutdown; it also encompasses some projects that had never been put under contract, but had merely been scheduled by the agencies. The actual work cancellation affecting volume statistics is, therefore, estimated at $600,000,000.

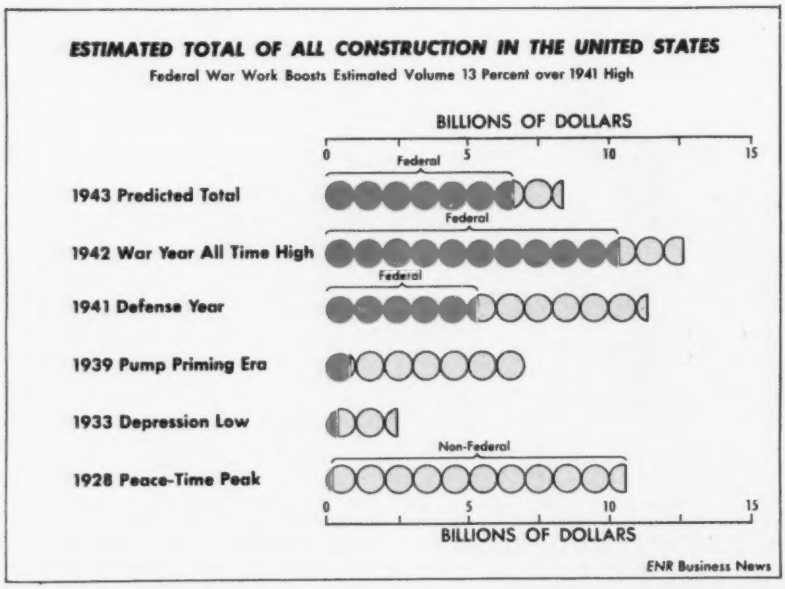
I—ESTIMATED TOTAL CONSTRUCTION

(Millions of Dollars)

	Public	Private	Total	ENR Vol. Index
1925.....	2,476	5,702	8,178	201
1926.....	2,670	6,208	8,878	228
1927.....	3,073	6,522	9,595	263
1928.....	3,480	7,100	10,580	287
1929.....	3,263	7,114	10,377	317
1930.....	3,363	4,695	8,058	260
1931.....	3,098	2,832	5,930	220
1932.....	1,918	921	2,839	127
1933.....	1,533	907	2,440	102
1934.....	2,373	731	3,104	114
1935.....	2,460	1,221	3,680	134
1936.....	3,140	2,450	5,590	185
1937.....	2,806	3,046	5,852	172
1938.....	3,680	2,800	6,480	197
1939.....	3,750	3,224	6,974	211
1940.....	4,550	3,960	8,510	269
1941.....	7,200	4,196	11,396	375
1942.....	11,061	1,760	12,821	553



Manufacturing and general business indexes established new marks in 1942, but their increases were not so pronounced as in engineering construction. The *Federal Reserve Board* Index of Industrial Production climbed 16 percent, and *Business Week's* Index of General Business was up 17 percent over 1941.



Prospects for 1943

Over $7,000,000,000 in new construction money was requested in the President's war budget message for the fiscal year 1943—$2,000,000,000 for industrial construction, and $5,000,000,000 for other construction, including camps and bases. Some of the funds, when appropriated, will be for construction outside the United States, but a major portion is believed to be slated for home front projects.

Current estimates for all United States construction in 1943 indicate a total of $8,260,000,000, a return to pre-war volume, and 35 percent below the peak attained in 1942. Federal work, still the major factor in the 1943 outlook as is evident from the

war budget, is expected to approximate $6,600,000,000, and state and municipal construction to total $408,000,000. This brings the public construction estimate to $7,008,000,000. The balance of $1,252,000,000 is estimated for private work, with private engineering responsible for $952,000,000, and small-scale residential building for $300,000,000.

Further WPB stop orders are anticipated on civilian and industrial war construction both on that which is underway and that which had merely been programmed. These expected cancellations result from the better-than-scheduled production rates of existing plants, and from changes in military requirements dictated by the progress of the war. All civilian projects ordered halted by WPB are automatically transferred to the postwar construction reserve for completion.

The succeeding pages present a detailed report on engineering construction, residential building, material and labor statistics, and an analysis of 1942 costs.

Record ENR Volume Tops $9 Billion

ENGINEERING CONSTRUCTION reported for the United States by *ENR* achieved the record total of $9,305,829,000, and averaged $175,582,000 for each of the 53 weeks of 1942. On the weekly average basis (to adjust for the difference in the number of weeks reported) it topped the mark established in 1941 by 56 percent, and more than doubled every other pre-war volume. Federal projects accounted for $8,241,038,000, or 88 percent of the reported total, and gained 131 percent over the 1941 high. State and municipal work, which combines with federal to make up the public total, declined 58 percent below a year ago to $508,918,000.

Public construction, $8,750,006,000, exceeded the 1941 high by 83 percent as a result of the federal gain. Private work, on the other hand, plagued to a greater extent by war restrictions, decreased to $555,823,000, the lowest volume since 1935, and 54 percent below last year. Construction ordered stopped by WPB order has not been deducted from these recorded totals.

Public building construction reached the all-time high of $5,678,103,000, just double the defense-primed 1941 total. Over 98 percent of the public building volume was for essential war structures: $1,786,182,000 for federally-owned, privately-operated plants; $591,729,000 for federally-owned and federally-operated plants; $611,442,000 for military housing; $548,664,000 for war workers' housing; and $2,026,281,000 for other military buildings.

In addition to the $2,377,911,000 for federally-financed war factories (both privately- and federally-operated), private industrial building amounted to $200,319,000, and brought the 1942 industrial and federal plant expansion total to $2,578,230,000. This combined volume was 20 percent above last year despite a 60 percent drop in privately-financed industrial building.

Commercial building and large-scale private housing totaled $291,703,000 for 1942. This volume, 96 percent of which was engineered residential building, was 41 percent below 1941.

Unclassified construction, heavily weighted with war projects, rose to $2,034,312,000 and doubled its 1941 high. Of this total, $1,937,084,000 was for federal work, $62,911,000 for private, and $34,317,000 for state and municipal.

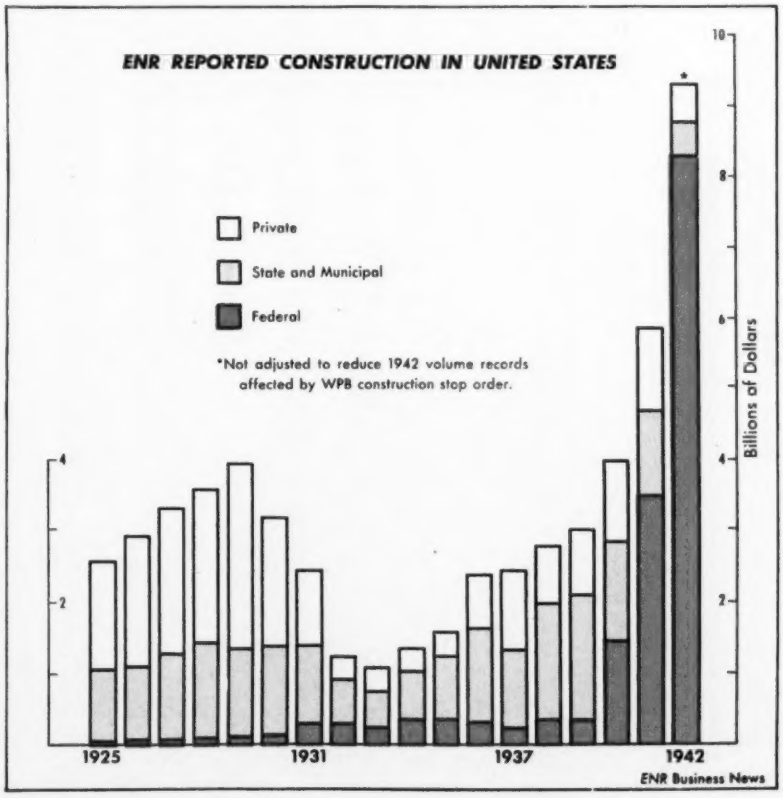
Providing sanitation facilities in military and war-industry areas boosted waterworks to $150,965,000, and sewerage construction to $118,437,000, up 93 and 31 percent compared with their respective totals of a year ago. Federally-financed projects accounted for $132,727,000, or 88 percent of the waterworks volume, and for $89,837,000, or 76 percent of the sewerage.

Earthwork and drainage volume, $251,328,000, topped last year by 1 percent, but WPB cancellations will cut this type of construction and postpone completion on many of the projects until after the war.

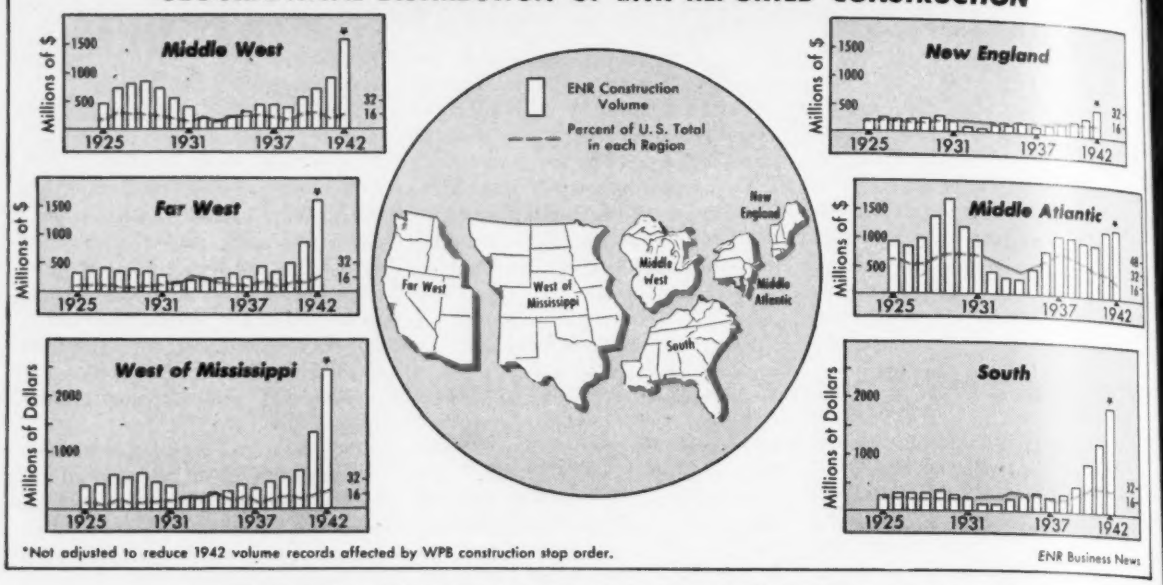
Highway construction, $530,504,000, was 11 percent below the 1941 total, and bridge volume, $50,158,000, dropped 56 percent to the lowest annual value on record.

Geographical Records

Geographically, the record-breaking 1942 construction volume was well-distributed, with five of the six sections of the nation reporting in-



GEOGRAPHICAL DISTRIBUTION OF ENR REPORTED CONSTRUCTION



*Not adjusted to reduce 1942 volume records affected by WPB construction stop order.

ENR Business News

II—ENGINEERING CONSTRUCTION REPORTED IN 1942 BY ENGINEERING NEWS-RECORD

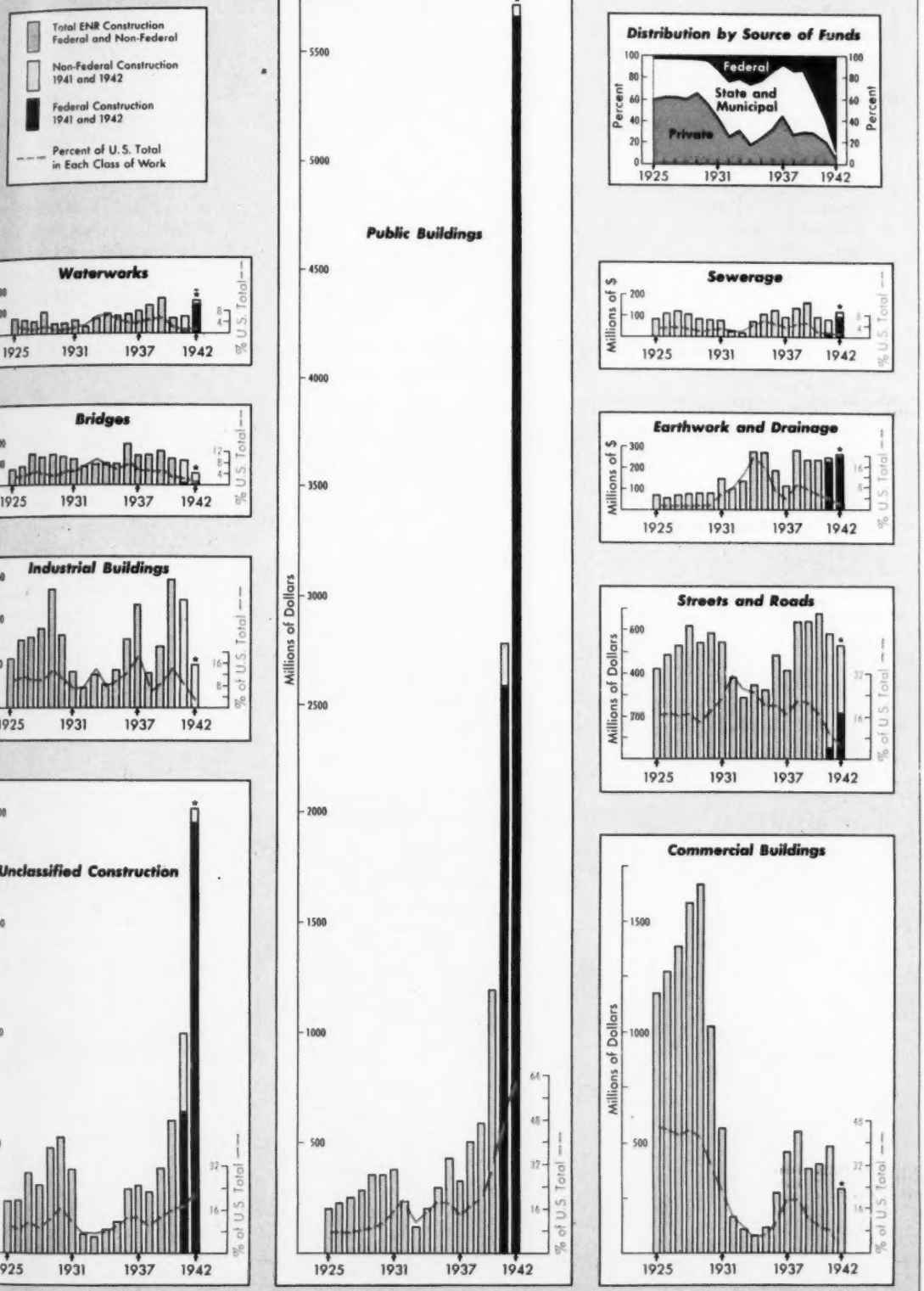
(Thousands of Dollars)

Minimum contracts reported: Waterworks, excavation, drainage and irrigation, $15,000; other public works, $25,000; industrial buildings, $40,000; other buildings, $150,000.

States	Water-works	Sewers	Bridges	Earth-work	BUILDINGS: Streets and Roads	Indus-trial	Com-mercial	Public	Un-classified	Federal Gov't work	All Construction: Private	ublic	1942 Total‡ 53 wks.	1941 Total 52 wks.	% Gain* '42/'41
Me	1,421	217	.....	1,886	673	379	4,294	15,521	14,001	34,187	4,808	33,584	38,392	40,134	−6
N. H	657	88	179	.....	547	85	450	2,054	7,173	10,005	535	10,698	11,233	22,163	−50
Vt	56	11	.....	.....	55	45	.....	1,583	245	1,172	147	1,848	1,995	4,369	−55
Mass	1,866	674	128	3,766	1,365	7,885	8,027	59,160	31,933	95,583	17,153	97,651	114,804	97,520	15
R. I	1,879	129	390	421	389	1,086	2,575	103,881	61,786	166,980	3,661	168,864	172,525	31,548	437
Conn	1,806	1,705	1,144	507	4,984	8,060	33,866	58,528	17,427	74,457	42,967	85,060	128,027	115,975	8
New England	**7,685**	**2,824**	**1,850**	**6,580**	**7,993**	**17,540**	**49,212**	**240,727**	**132,565**	**382,984**	**69,271**	**397,705**	**466,976**	**311,709**	**47**
N. Y	1,770	4,878	2,431	2,541	17,065	2,697	9,225	240,038	77,387	310,123	15,347	342,685	358,032	480,801	−27
N. J	4,496	5,595	2,133	5,714	12,171	12,276	34,878	105,756	40,527	150,771	51,405	172,141	223,546	218,956	0
Pa	1,852	988	2,877	574	21,131	21,256	29,734	278,504	55,957	332,317	53,322	359,551	412,873	359,548	13
Md	4,449	2,135	3,793	2,035	9,759	3,043	12,363	121,945	17,754	145,788	16,539	160,737	177,276	93,174	87
D. C	812	245	3,351	.....	3,706	700	.....	26,424	3,927	26,382	700	38,465	39,165	47,216	−19
Del	175	50	.....	.....	786	.....	955	9,323	3,209	12,710	955	13,543	14,498	11,666	22
Middle Atlantic	**13,554**	**13,891**	**14,585**	**10,864**	**64,618**	**39,972**	**87,155**	**781,990**	**198,761**	**978,091**	**138,268**	**1,087,122**	**1,225,390**	**1,211,361**	**−1**
Va	6,035	1,584	3,462	93	19,486	6,875	2,248	185,302	72,895	273,061	9,202	288,778	297,980	135,103	116
W. Va	150	404	456	11,466	4,401	400	.....	9,173	1,208	21,193	1,608	26,050	27,658	39,912	−32
N. C	5,820	1,296	766	16,726	4,042	230	150	88,866	57,034	168,069	1,039	173,891	174,930	139,634	23
S. C	2,424	1,375	701	19	13,325	.....	2,968	37,131	30,625	77,547	3,568	85,000	88,568	59,125	47
Ga	2,143	2,467	999	700	17,081	40	300	92,408	43,106	146,883	463	158,781	159,244	124,764	25
Fla	13,138	3,864	1,219	4,623	23,539	3,655	372	101,558	210,398	345,697	8,537	353,829	362,366	101,496	250
Ala	3,792	2,240	735	17,200	15,001	13,115	2,295	118,479	15,842	165,771	16,010	172,689	188,699	190,950	−1
Miss	1,339	3,276	.....	2,848	8,960	220	550	84,386	21,488	117,524	1,588	121,479	123,067	74,572	62
La	3,307	2,610	147	856	7,158	1,026	1,794	91,609	33,053	126,710	8,524	133,036	141,560	143,775	−3
Ky	449	300	355	50	10,852	290	.....	58,016	6,478	64,399	2,208	74,582	76,790	98,424	−23
Tenn	4,482	3,972	627	86,728	10,097	1,695	1,020	128,595	52,094	279,301	2,844	286,466	289,310	137,520	106
Southern	**43,097**	**23,388**	**9,467**	**141,309**	**133,942**	**27,546**	**11,697**	**995,523**	**544,221**	**1,786,155**	**55,591**	**1,874,581**	**1,930,172**	**1,245,275**	**52**
Ohio	5,372	6,590	2,492	3,828	24,494	24,218	17,013	222,513	46,875	275,345	41,631	311,764	353,395	245,078	41
Ind	8,495	5,031	1,105	311	14,120	4,579	3,257	262,419	35,371	310,714	10,499	324,189	334,688	196,720	67
Ill	2,375	2,532	2,977	1,009	39,880	14,030	6,535	411,991	42,185	461,041	20,836	502,678	523,514	231,759	122
Wis	471	3,472	70	335	6,946	7,140	4,818	67,408	14,202	90,693	12,263	92,599	104,862	109,123	−6
Mich	10,671	9,112	3,376	2,000	24,803	20,283	930	125,576	74,712	230,035	21,363	250,100	271,463	125,950	112
Middle West	**27,384**	**26,737**	**10,020**	**7,483**	**110,243**	**70,250**	**32,553**	**1,089,907**	**213,345**	**1,367,828**	**106,592**	**1,481,330**	**1,587,922**	**908,630**	**72**
Minn	21	262	108	193	5,449	4,266	300	7,482	3,544	10,377	4,916	16,709	21,625	73,875	−71
Iowa	726	302	1,162	1,148	11,840	1,759	150	37,800	18,424	63,152	2,626	70,685	73,311	74,672	−4
Mo	545	1,474	521	2,497	7,289	2,515	5,790	128,907	34,510	166,717	9,248	174,800	184,048	189,748	−5
Ark	5,045	1,894	374	8,744	6,621	6,440	4,220	72,203	43,255	129,501	14,160	134,636	148,796	109,983	33
N. D	161	.....	.....	.....	3,034	170	.....	750	708	1,288	195	4,718	4,913	6,600	−27
S. D	483	716	.....	.....	1,606	.....	.....	31,108	20,619	52,628	150	54,382	54,532	9,934	439
Neb	2,067	984	59	325	26,104	790	1,200	163,272	32,747	221,732	2,374	225,174	227,548	28,121	694
Kan	6,513	2,432	448	182	13,767	840	1,070	143,865	69,550	230,899	2,494	236,173	238,667	73,138	220
Okla	3,215	1,398	3,326	266	10,848	250	400	158,330	42,835	208,143	1,447	219,450	220,897	111,892	94
Tex	21,553	17,670	1,366	14,373	39,691	10,865	22,484	718,115	230,264	993,920	49,216	1,027,165	1,076,381	585,912	80
Mont	300	200	26	9,005	1,047	45	.....	5,740	7,089	22,281	45	23,407	23,452	12,331	87
Wyo	50	100	35	66	468	.....	200	3,925	16,873	20,704	200	21,517	21,717	14,569	46
Colo	516	706	46	98	3,817	.....	.....	77,086	23,000	100,075	292	104,977	105,269	36,172	186
N. M	1,412	968	.....	997	3,007	.....	210	25,279	33,901	65,575	793	64,981	65,774	18,230	254
West of Miss.	**42,607**	**29,106**	**7,471**	**37,914**	**134,588**	**27,960**	**36,024**	**1,573,871**	**577,409**	**2,286,992**	**88,156**	**2,378,744**	**2,466,930**	**1,345,177**	**80**
Idaho	341	95	.....	10	4,461	190	.....	23,558	34,490	58,695	190	62,955	63,145	23,381	165
Utah	768	1,750	66	278	5,035	445	1,860	107,500	7,571	117,229	2,305	122,968	125,273	74,596	68
Ariz	948	1,630	.....	9,859	6,567	500	200	57,708	43,125	117,873	700	119,837	120,537	37,182	218
Nev	185	1,011	.....	9,565	2,836	190	600	37,109	18,363	65,174	820	69,039	69,859	31,229	119
Wash	4,112	4,049	1,499	8,173	14,188	1,350	4,680	220,898	53,054	284,968	6,251	305,752	312,003	141,985	119
Ore	499	115	383	874	10,970	710	200	74,267	33,569	111,971	1,881	119,706	121,587	65,003	83
Calif	9,803	13,841	4,817	18,419	35,063	13,686	67,522	475,045	177,839	683,128	85,798	730,237	816,035	473,171	69
Far West	**16,656**	**22,491**	**6,765**	**47,178**	**79,120**	**17,071**	**75,062**	**996,085**	**368,011**	**1,439,038**	**97,945**	**1,530,494**	**1,628,439**	**846,547**	**89**
U. S. 1942	**150,965**	**118,437**	**50,158**	**251,328**	**530,504**	**280,319**	**291,703**	**5,678,103**	**2,034,312**	**8,241,088**	**555,823**	**8,750,006**	**9,305,829‡**	.....	.....
U. S. 1941	76,698	88,719	111,628	245,221	582,847	496,176	485,683	2,785,585	996,142	3,500,488	1,178,082	4,690,617	.....	5,868,699	.....
% Gain '42/'41*	**93**	**31**	**−56**	**1**	**−11**	**−60**	**−41**	**100**	**100**	**131**	**−54**	**83**	.....	.....	**56**
Canada '42	4,244	3,630	1,570	1,501	24,150	43,922	3,528	80,370	62,214	.....	48,818	176,330	225,148	.....	.....
Canada '41	3,004	1,963	1,835	1,979	12,304	92,906	12,190	49,509	86,842	.....	122,248	140,284	.....	262,532	−16

* Adjusted for difference in number of weeks. ‡ Volume of construction stopped by WPB order estimated at $1,200,000,000, not deducted from this recorded total of work started in 1942.

ENR REPORTED CONSTRUCTION VOLUME BY CLASS OF WORK



*Not adjusted to reduce 1942 volume records affected by WPB construction stop order.

ENR Business News

creases over their respective 1941 highs. New England volume, $466,976,000, climbed 47 percent above the 1941 mark; South, $1,930,172,000, was up 52 percent; Middle West, $1,587,922,000, 72 percent; West of Mississippi, $2,466,930,000, 80 percent; and Far West, $1,628,439,000, up 89 percent. The Middle Atlantic total, $1,225,390,000, was 1 percent below last year.

Residential building

Preliminary estimates of dwelling unit construction in 1942 indicate that 473,000 new units were begun in urban and rural non-farm areas. This volume was 34 percent below the 715,000 units reported for last year, and the smallest annual total since 1938, according to the Bureau of Labor Statistics.

One-family dwelling units, at 391,000, were 36 percent below 1941; two-family units, 18,000, were down 47 percent; and multi-family units, 64,000, were 6 percent lower.

Publicly-financed units approximated 172,000, 36 percent of the 1942 total, an increase of 80 percent over the preceding year. Privately-financed units, on the other hand, were 51 percent lower. Every section of the nation and all city-size groups reported decreases in the number of units as compared with a year ago.

Permit valuation of the 473,000 dwelling units for 1942 was estimated at $1,490,000,000, 40 percent below 1941. Forecasts for 1943 predict a total of 325,000 new units, with a valuation of $1,000,000,000.

The value of building permits issued in 257 given cities approximated $1,150,000,000 in 1942, 42 percent below the preceding year, and the lowest volume recorded by the Bureau of Labor Statistics since 1936. New residential construction in those same cities, $475,000,000, declined 45 percent; non-residential, $500,000,000, was down 41 percent; and alterations and additions, $175,000,000, were off 34 percent compared with 1941.

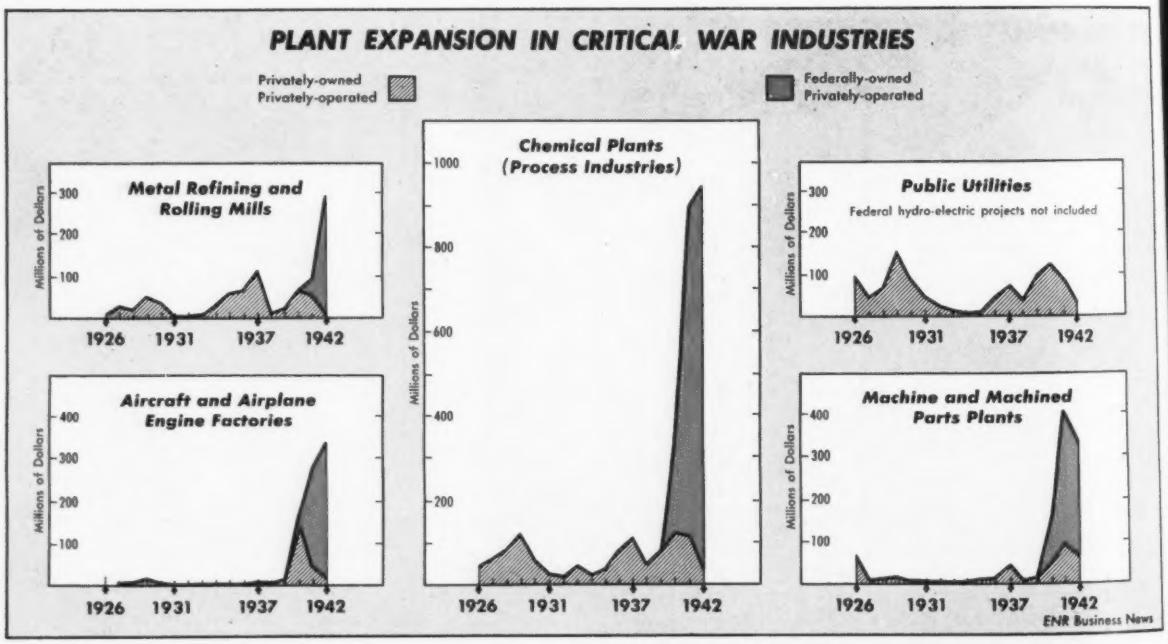
FHA mortgages selected for appraisal, $1,238,000,000, were 19 percent lower than a year ago, the first

III—CONTRACTS FOR PRIVATE INDUSTRIAL BUILDING CONSTRUCTION BY INDUSTRIES

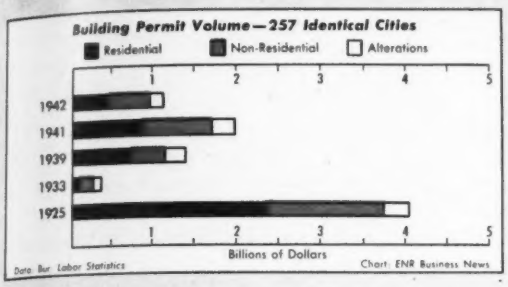
(Value in Thousands of Dollars ENR Reports)

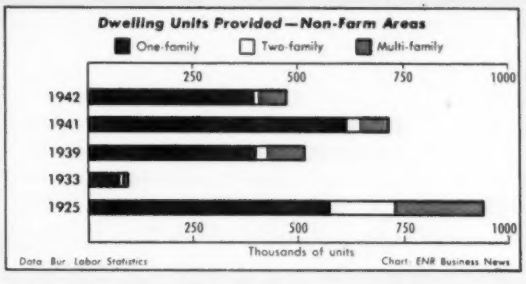
Transportation Service	1928	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942 No.	1942 Value
1. Railroads	.....	.....	.....	.....	$1,108	$3,621	$909	$712	$1,690	$2,417	$2,546	$1,447	$1,827	$2,965	31	$2,475
2. Automotive	$37,181	$28,962	$18,090	$10,479	9,562	10,288	5,655	4,173	5,127	8,431	4,250	4,114	5,077	9,202	29	1,793
Public Utilities	64,373	151,033	86,137	40,813	22,800	14,290	1,741	7,577	42,481	70,765	37,658	94,822	121,155	86,180	39	29,225
Process Industries (a)	82,591	122,048	52,741	24,679	19,002	43,203	21,922	34,655	81,627	111,246	45,529	78,239	123,165	115,539	174	42,263
Food Industries (b)	32,957	32,138	21,289	14,311	14,385	50,038	20,674	19,655	28,639	36,248	13,838	23,049	28,292	34,263	130	9,344
Metal Refining and Rolling	19,014	48,920	34,083	3,515	745	6,979	31,609	59,075	65,505	111,426	8,590	22,340	66,390	52,636	35	9,217
Metal Working Plants																
1. Auto Factories*	.....	.....	6,380	3,120	3,735	331	1,709	3,553	17,410	21,763	2,665	1,562	5,535	2,980	4	530
2. Aircraft Factories	4,361	14,818	2,230	75	418	128	30	425	915	4,312	590	11,037	137,656	40,977	27	16,687
3. Foundries	4,752	4,150	2,146	1,686	188	465	368	1,952	1,541	1,890	335	1,819	2,050	2,235	39	6,629
4. Mach. and Mach. Parts (c)	11,503	17,044	6,374	6,639	5,220	2,848	3,404	11,079	14,560	41,030	8,757	14,343	48,446	93,965	533	64,638
Textiles (excluding rayon)	9,103	9,705	3,300	2,427	2,047	2,781	1,431	2,216	3,421	5,017	2,089	3,714	1,931	9,148	8	366
Wood Industries	2,652	4,857	1,400	726	595	2,296	488	999	1,008	825	480	950	2,890	2,672	16	700
Miscellaneous																
1. General Factories	75,989	110,311	87,274	53,181	12,646	14,618	14,752	26,118	45,344	61,511	23,760	24,744	49,065	42,634	212	15,729
2. Refrig'n. and Cold Storage	10,817	3,327	9,727	4,099	613	490	500	278	209	417	1,011	800	585	780	7	585
Total	**$355,187**	**$547,313**	**$331,171**	**$165,750**	**$93,064**	**$152,376**	**$105,192**	**$172,467**	**$309,477**	**$477,298**	**$152,098**	**$282,980**	**$594,064**	**$496,176**	1,284	$200,319

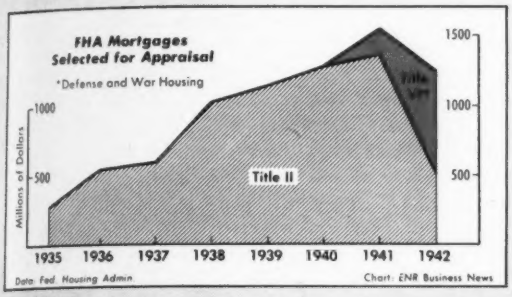
*Auto factories for years 1926, 1927, 1928 and 1929 are included under "Automotive"—Transportation Service.
(a) Includes Distilleries.
(b) Includes Breweries and Wineries.
(c) Includes Radio Plants.

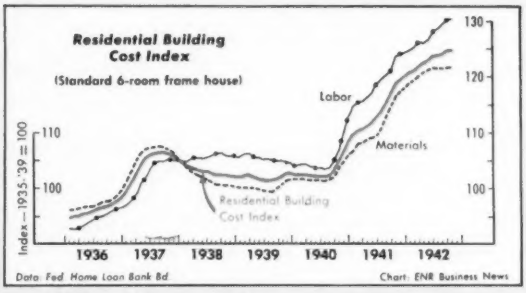


RESIDENTIAL BUILDING ROUND-UP









year since the beginning of the program in 1935 that they failed to gain. Almost 60 percent of the year's mortgage total, $727,000,000, was for war housing, 300 percent over 1941.

Residential building costs rose 3.2 percent in the first ten months of 1942, as reported by the Federal Home Loan Bank Board. This index of building costs for a standard six-room frame house, based on reports from 80 cities, revealed material costs 2.5 percent higher and labor rates up 4.6 percent.

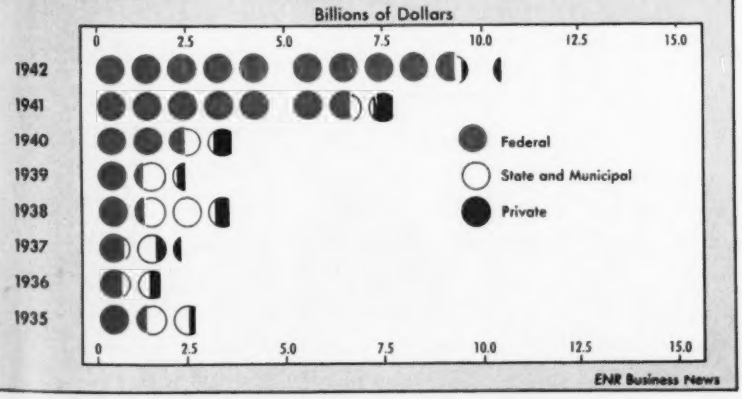
The residential building cost index average for the ten-month 1942 period, 122.9, was 8 percent above the 1941 annual average, and 19 percent over that recorded for 1940.

New Construction Financing

NEW CONSTRUCTION capital volume for 1942, heavily weighted with federal appropriations for war projects, attained the record high of $10,219,318,000. Approximately 94 percent of the new capital total, $9,579,186,000, was federal financing; $217,248,000 was for state and municipal work; $182,729,000 was for corporate expansion; $157,455,000 was in RFC loans, both for public improvements, and for private industrial facilities; and $82,700,000 was for federal aid for state highways.

The year's new construction financing total exceeded the former high of 1941 by 27 percent as a result of the 44 percent climb in the federal portion of the total. Non-federal construction capital, $640,132,000, was 54.5 percent below the $1,380,761,000 reported for a year ago.

SOURCE AND VOLUME OF NEW CONSTRUCTION MONEY



IV—NEW CONSTRUCTION CAPITAL

(Millions of Dollars)

	Corporate	State and Municipal	Federal	Total
1925	$1,966	$1,352	.....	$3,318
1926	1,824	1,344	.....	3,168
1927	1,784	1,475	.....	3,259
1928	1,568	1,379	.....	2,947
1929	1,758	1,418	.....	3,176
1930	2,032	1,434	.....	3,466
1931	787	1,235	.....	2,022
1932	159	561	.....	720
1933	292	1,091‡	.....	1,383
1924	77†	1,011‡	194	1,282
1935	47†	1,337‡	1,354	2,738
1936	251	698‡	691	1,640
1937	518†	738‡	946	2,202
1938	457†	1,902‡	1,345	3,704
1939	304†	783‡	1,318	2,405
1940	624†	805‡	2,466	3,895
1941	741†	477‡	6,677	7,895
1942	332†	225‡	9,662	10,219

Note:—Federal appropriations include federal-aid highway, WPA, and regular departmental appropriations for construction.

† Includes $237,000,000 RFC and PWA loans '33; $55,000,000, '34; $9,000,000, '35; $807,000 '37; $76,106,000 REA, $4,500,000 RFC loans, '38; $89,000,000 REA and $400,000 RFC loans, '39; $40,000,000 REA and $193,000,000 in RFC loans '40; $100,500,000 in REA and $282,000,000 in RFC loans in '41; $149,800,000 in RFC in '42.

‡ Includes $814,000,000 RFC and PWA loans and grants, '33; $580,000,000, '34; $808,000,000, '35; $164,700,000, '36; $207,000,000, '37; $723,265,000 PWA, $99,844,000 RFC, $320,986,000 USHA loans, '38; $216,000,000 in USHA loans, '39; $219,000,000 USHA, $5,000,000 RFC loans in '40; $30,000,000 in USHA, $6,900,000 in RFC loans in '41; $7,655,000 in RFC loans in '42.

Employment and Materials

CONTRACT CONSTRUCTION employment averaged 2,635,000 workers per month for the first ten months of 1942, an increase of 2 percent over the employment average reported for the corresponding period in 1941. These estimates, as reported by the National Industrial Conference Board, are based on contract construction employment at the project site, and do not include force-account workers, WPA construction laborers, or workers engaged in off-the-site prefabrication.

The 1942 peak was attained in August when 2,952,000 men were employed in the construction industry. Preliminary figures for November revealed that the number of workers had declined 338,000 from the August high.

The total labor force in the United States averaged 55,160,000 workers for the ten months of 1942, up 8 percent compared with the period a year ago. From a force of 50,356,000 in January 1942, total employment climbed to 59,509,000 in October.

Federal and state highway construction employment, hit hard by war restrictions and reduced revenues, averaged 74,254 workers per month through October, a 33 percent decrease from 1941.

Material shipments

Trends of shipments of major construction materials were mixed in 1942, resulting largely from restrictions placed on critical products. In steel, for instance, ingot production reached the record-breaking volume of 82,836,946 net tons, but as a result of allocations a smaller share was permitted for construction despite the heavily increased demand. Thus, shipments of fabricated structural steel for 1942, 2,039,966 tons, were 9 percent below 1941 even though heavy engineering construction climbed 56 percent.

Portland cement shipments, with comparatively no priority problems, totaled 185,167,000 barrels, a new all-time high, 10.6 percent higher than a year ago. Lumber shipments, including other-than-construction lumber, reached 29,328 million board feet in the first ten months of 1942, 1 percent above the 1941 twelve-year high. Douglas fir plywood production and shipments were nearly 1.8 billion square feet in 1942, a new record. Construction is estimated to take 60 percent of this output.

Asphalt roofing shipments were expected to exceed 52 million squares in 1942 as a result of the demand engendered by the war building program. This estimated volume topped 1941 by 24 percent and reached the highest shipment total on record.

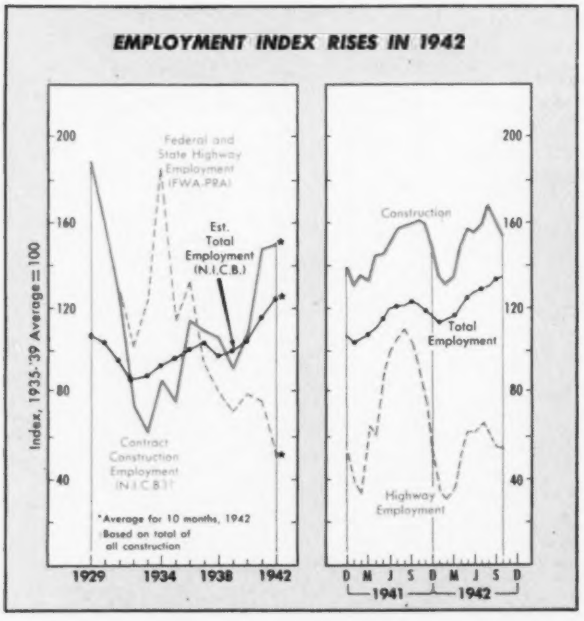
Vitrified paving brick shipments were estimated at 24,000,000 bricks for 1942, a decrease of 34 percent from the preceding year's total.

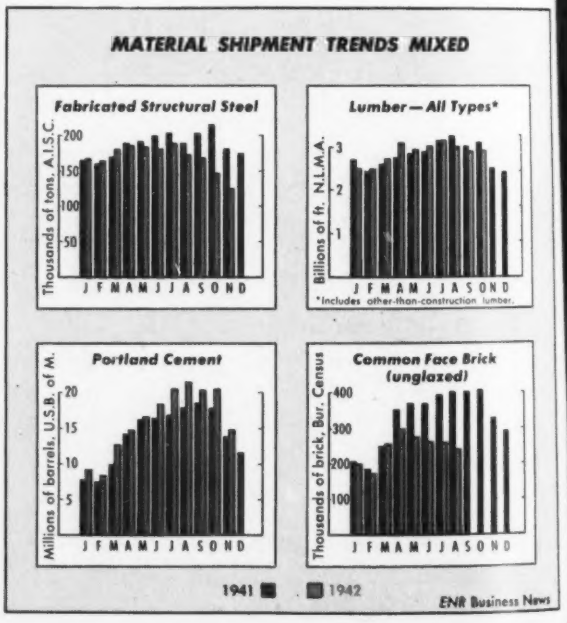
Indications are that war demands will continue to cut into construction material needs during the year ahead and that those critical materials allocated to the industry will be almost entirely absorbed by war construction requirements.

V—OUTPUT OF VARIOUS CONSTRUCTION MATERIALS FOR TEN-YEAR PERIOD

Item	Basis	Unit	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942*	% Change '41 to '42
Lumber	Production	Millions Bd. ft	14,696	15,494	19,539	24,355	25,997	21,646	24,775	28,934	33,476	31,700	−5
Cement	Shipments	Thous. Bbl	64,283	75,901	75,239	112,850	113,805	106,324	122,651	130,350	167,508	185,167	+11
Steel Ingots	Production	Thous. net Tons	25,305	28,671	37,428	52,425	55,443	31,071	51,585	66,982	82,837	86,092	+4
Fabricated Structural Steel	Shipments	Thous. Tons	828	1,034	1,095	1,548	1,661	1,159	1,440	1,516	2,251	2040	−9
Fabricated Steel Plate	New Orders	Thous. Tons	198	242	258	484	429	285	357	†	†	†	...
Explosives	Shipments	Thous. lb	249,366	307,380	297,730	378,361	387,805	320,259	372,470	406,671	460,075	475,600	+3
Common Brick	Shipments	Millions	.....	637	952	1,720	1,806	1,537	1,966	1,908	3,916‡	**	
Vit. Paving Brick	Shipments	Thousands	.....	87,216	62,528	96,001	79,716	84,887	68,439	56,116	36,584	24,000	−34
Prepared Roofing	Shipments	Thous. squares	24,732	24,000	26,052	32,237	29,942	34,610	34,144	32,597	42,377	52,700	+24

* Estimated Totals. † Temporary discontinued. ‡ Not on comparable basis with preceding years. ** In process of revision; no new data available.





Cost Climb Continues in 1942

CONSTRUCTION COSTS continued their climb in 1942, exceeding their all-time high average of 1941 by 7.2 percent according to the *ENR* Construction Cost Index. This measure of basic cost factors opened 1942 at 267.63, and by June had passed the long-standing record of 273.80 established in June, 1920. By December, the index value had reached 283.69, a climb of 6 percent in the year.

The lumber and common labor components of the index were the principal factors behind the increased costs, as cement recorded only a minor gain, and structural steel was unchanged from its last year's level.

The steel component has remained stable since July 1938, and the cement rise last April was the first since February, 1938.

VI—CONSTRUCTION AND BUILDING COST INDEX
(1913 = 100)

GENERAL INDEXES

	1929 Aver.	1941 Aver.	1942 Aver.	Dec. 1942
E N R Construction	207	258	276	284
E N R Building	191	211	222	227
Assoc. Gen. Contractors (Bldg.)	203	198	209	214
American Appraisal Co. (Bldg.)	217	217	241	248
E. H. Boeckh (Brick and Cone., Bldg., New York	242	255	260	262

CONTRACTORS' INDEXES

Aberthaw Co. (Bldg.)	190	207	223	225
Turner Co. (Bldg.)	185	215	245	252
Austin Co. (Bldg.)	170	198	213	213

Lumber climbed steadily during the first seven months of the year, and, after a small decrease in August and September, rose again in October and December. At the year-end, the lumber component was 9.6 percent higher than in January, 1942.

The common labor factor increased 7.2 percent during 1942, climbing in eight of the twelve months.

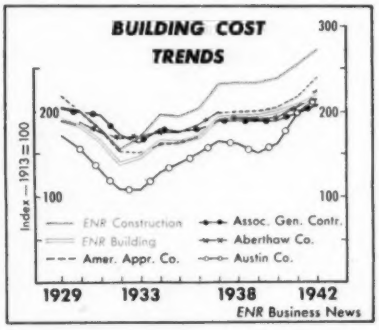
ENR Building Cost Index average for 1942 reached a new high, 222.39, and gained 5.2 percent over a year ago. This index, differing from the Construction Cost Index only in the substitution of the skilled labor component for common labor, was 217.12 in January. After rising steadily throughout the year it reached 226.63 in December, up 4.4 percent compared with the initial 1942-month's value. The skilled labor index factor increased 4.4 percent during the year, climbing in every month but December when it remained unchanged from the preceding month.

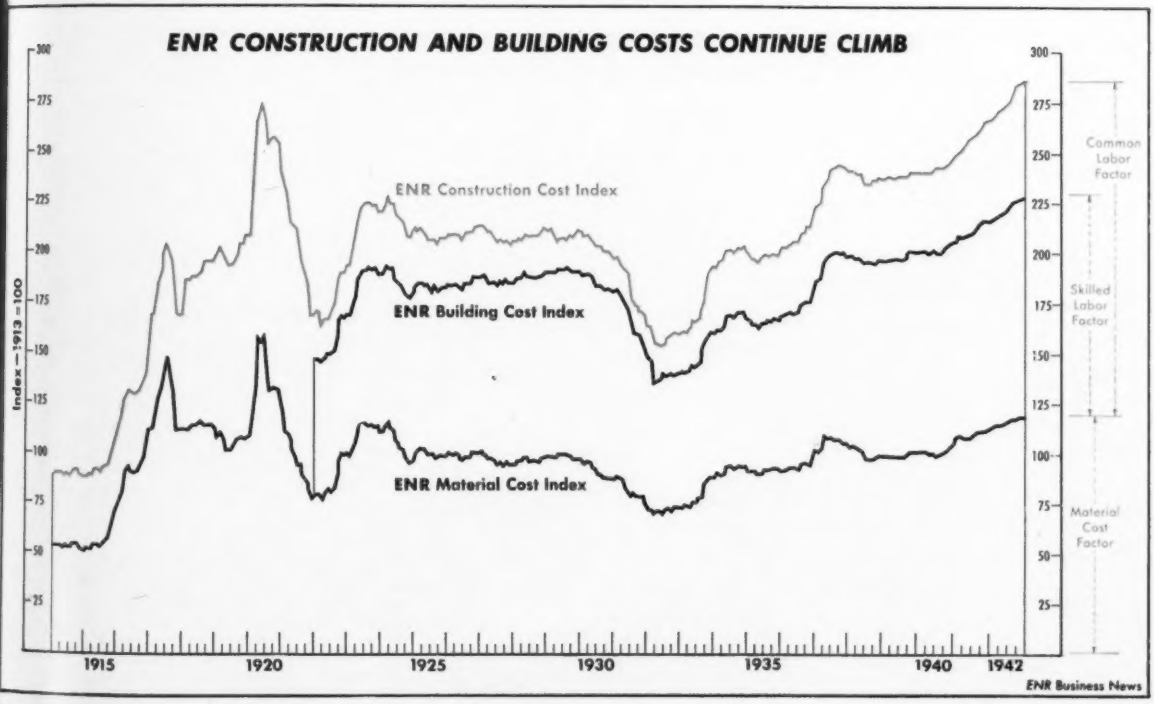
Values of three other general building cost indexes were up in 1942, differing from *ENR* cost trends only in the size of increase reported. The American Appraisal Co. Index was 11 percent higher than its 1941 average; Associated General Contractors Index was up 5.5 percent; and the E. H. Boeckh Index for New York City rose 2 percent.

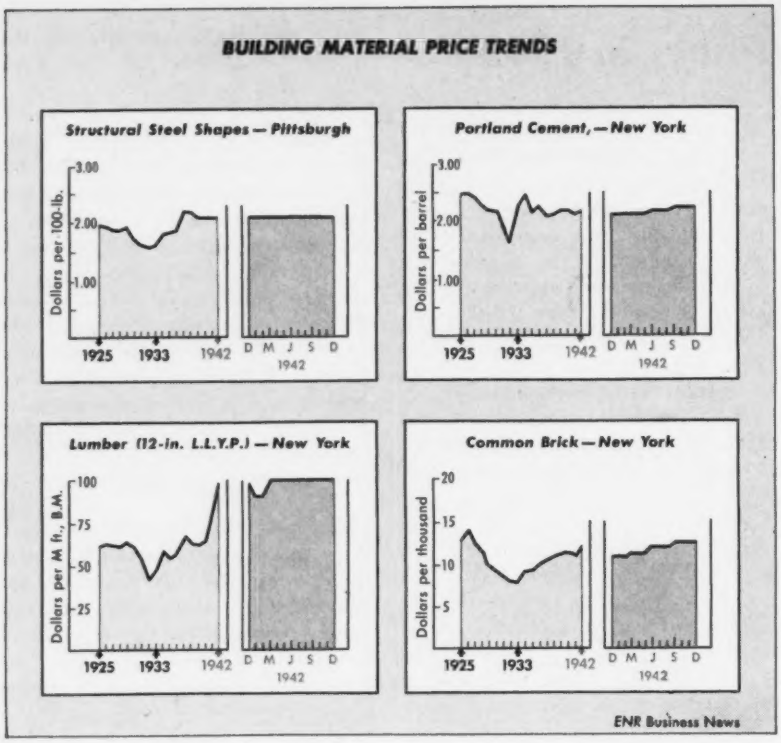
Contractors' cost indexes, which, in addition to material and labor factors, takes into consideration invisible costs added by lower labor efficiency, increased use of overtime, delayed deliveries, higher freight rates for longer shipping distances, etc., also topped their 1941 averages. The Austin Co. Index average rose to 213 in 1942, and the Aberthaw Co. Index to 223, both 8 percent above a year ago. The Turner Construction Co. Index, 245, was 14 percent higher than in 1941.

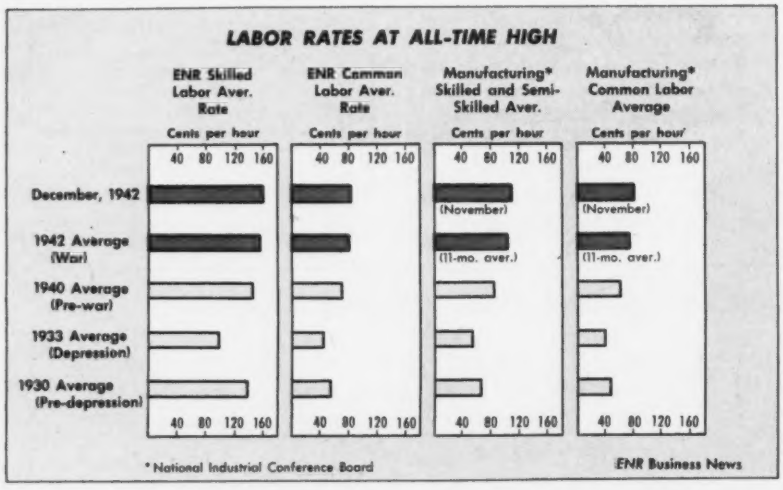
Labor rates

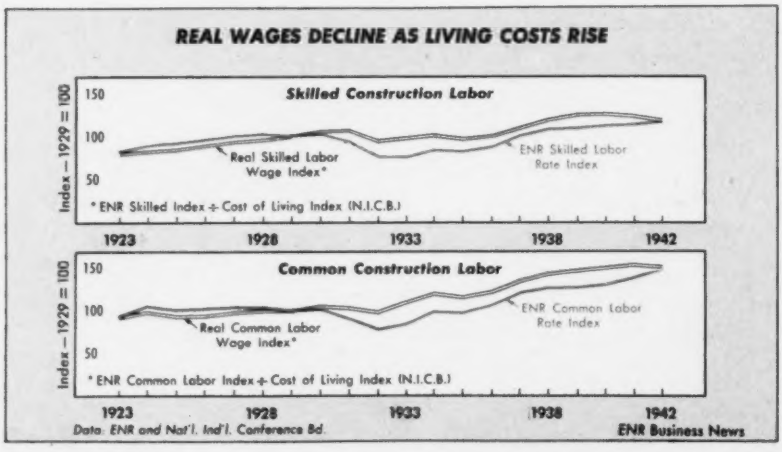
Common labor hourly rates in the construction industry reached a new all time high average of 80.4c., an 8.2 percent increase over the 1941 value. These rates, the average of











twenty cities reporting to *ENR*, opened the year at 77.6c. per hour and closed at 83.2c.

Skilled construction labor's average rate for the *ENR* 20-cities was $1.531 at the beginning of 1942 and by December had climbed to $1.599 per hour a gain of 4.4 percent. The annual average, $1.563 per hour, was 4.5 percent above the former high of a year ago.

Bricklayers' 1942 hourly rate averaged $1.663; carpenters', $1.404; and structural ironworkers', $1.622, all attained new record levels.

Common and skilled labor hourly rates in 26 manufacturing industries in 1942 again gained at a faster pace than those reported in construction. The hourly rate for common labor in manufacturing, based on eleven-month statistics, increased 11.4 percent over 1941, and skilled labor was up 13.4 percent, according to the National Industrial Conference Board statistics.

Real income, the actual hourly earnings adjusted for changes in living costs, decreased for both skilled and common construction laborers in 1942. Although skilled labor gained 4.5 percent and common rose 8.2 percent, living costs as computed by the National Industrial Conference Board climbed 9.8 percent, more than offsetting the construction labor rate gains.

Material prices

Construction material price averages were generally higher in 1942. Exceptions, however, were cast iron pipe and structural steel shapes, unchanged from a year ago. In New York, portland cement averaged $2.20 per barrel, not including sack cost, and was up 2.3 percent compared with the 1941 average price. Longleaf yellow pine (12x12-in.) was 18 percent higher than a year ago. The 20-cities' average price for 2x4-in. pine, $43.21 per M ft., rose 11 percent over last year, and 2x4-in. fir, $49.21 per M ft., was up 16 percent in the period.

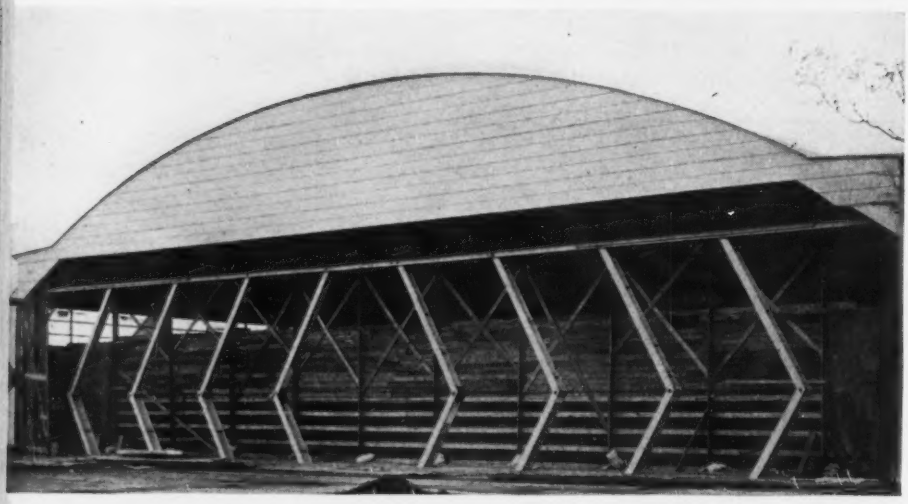
Common brick in New York began 1942 at $13.00 per M, increased to $13.50 in March, to $14.50 in June, and to $15.00 in September, a price that prevailed for the balance of the year. The annual average, $14.17, was the top since 1928, and climbed 8 percent over 1941. Lime prices averaged $2.80 per barrel, a gain of 4 percent over last year.

PICTORIAL RECORD OF ENGINEERED CONSTRUCTION IN 1942

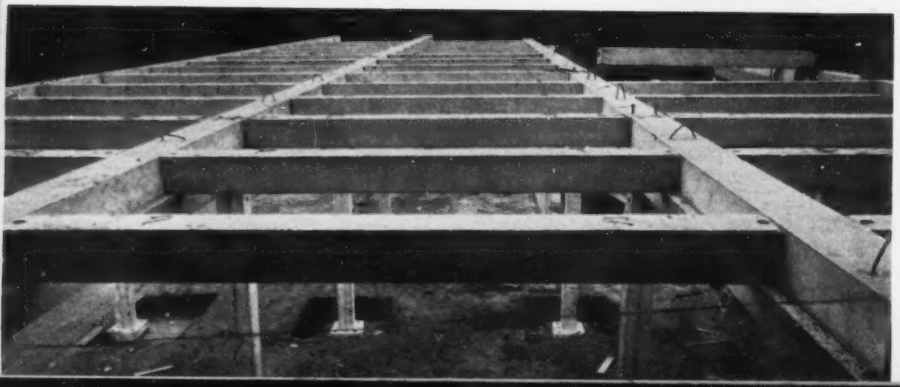
A camera round-up of accomplishments and innovations in a year that was crowded with spectacular and speedy progress

Hangars to house the Navy's blimps called for a large number of 328-ft. span, steel-arch trusses. The arches are all-welded except for the field splices and have a rise of 185 ft. to their centerlines. They rest on pinned shoes tied together across the hangar by 1⅝-in. dia. rods beneath the floor. Each arch is 8 ft. deep and is divided into 10 panels each side of the crown. Their tremendous size is indicated by the photo, which also shows some of the framing for the orange-peel door that will close the end. The erection jumbo is 200 ft. wide, 86 ft. long, and 175 ft. high, consisting of about 500 tons of steel. (Dec. 17, 1942, p. 841.)

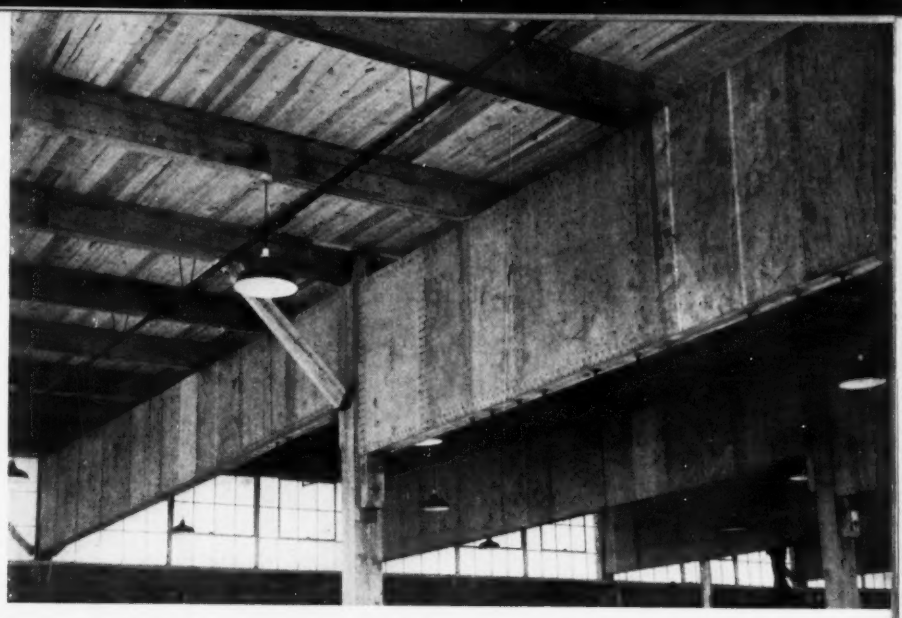
Late in September at Union Square in San Francisco, a four-story underground garage, which also can be used as an air-raid shelter, was completed. It has a capacity of 1,700 cars and occupies a 275x412-ft. area owned by the city. Maximum grade on the ramps is 8 percent. (Oct. 15, 1942, p. 520.)



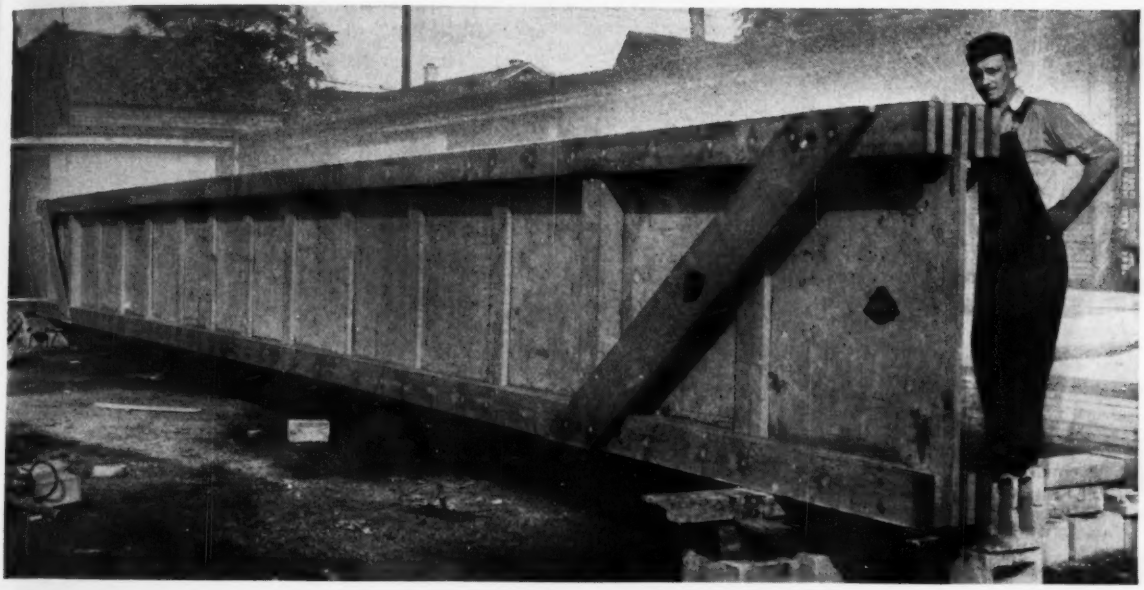
At an Army school in Texas collapsible doors were employed for the aircraft hangars. The doors can be collapsed vertically to fit into 5½-ft. deep, 20 in. wide trenches below floor level. The first doors installed were of wood-frame construction, but later two steel channels were used for the top chord and steel H-sections for web members. The doors are faced with overlapping plates of 18-gage steel 30-in. wide, which are hung from the frame in a manner that permits them to telescope into the trench as the door is lowered. (May 7, 1942, p. 772.)



Framing for a number of buildings built in the Pittsburgh area in 1942 consisted of precast concrete members. All of the members were manufactured at a central yard with forms that could be used many times over. Frame members are bolted together in both the longitudinal and transverse directions. The floor panels likewise are precast of concrete.



For an RCA Manufacturing Co. plant the H. K. Ferguson Co., Cleveland, developed 36-ft. girders with double webs of plywood, an innovation in timber construction. The members have ⅝-in. webs inclosing laminated chords of 2x6-in. planks and vertical stiffeners varying in size from 6x10's to 2x6's. The stiffeners also serve as splicing members for the plywood sections. The chords, which increase in section from the ends towards the center, are assembled with ⅝-in. bolts and split ring connectors. The webs are fastened to the chords and stiffeners by cement-coated nails driven to a pattern similar to the rivet spacing on steel plate girders. (April 23, 1942, p. 625).

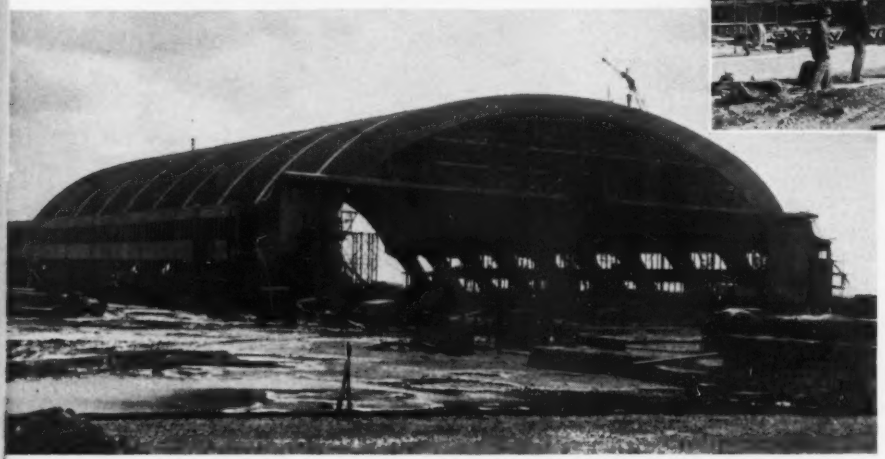


To save steel, timber was used in many different ways in 1942. Pictured above is a 60-ft. plywood girder of 60-in. depth designed for a live load of 1,200 lb. per lin. ft. The web is a 1½-in. thickness of plywood and each flange consists of eight 2x8-in. fir timbers, four on each side of the web. Diagonals are 2x12-in. timbers to transfer stress from bottom to top chord. Maple dowels of 1⅓-in. dia. instead of bolts were used in fabrication of the girders.

Manufacturing plants with walls of glass block were built extensively in 1942 for production of war products. Over 50 percent of the walls of this 9-story, air-conditioned, reinforced-concrete frame structure was built of glass blocks. There being no shortage of glass blocks, use of that material permitted rapid construction.

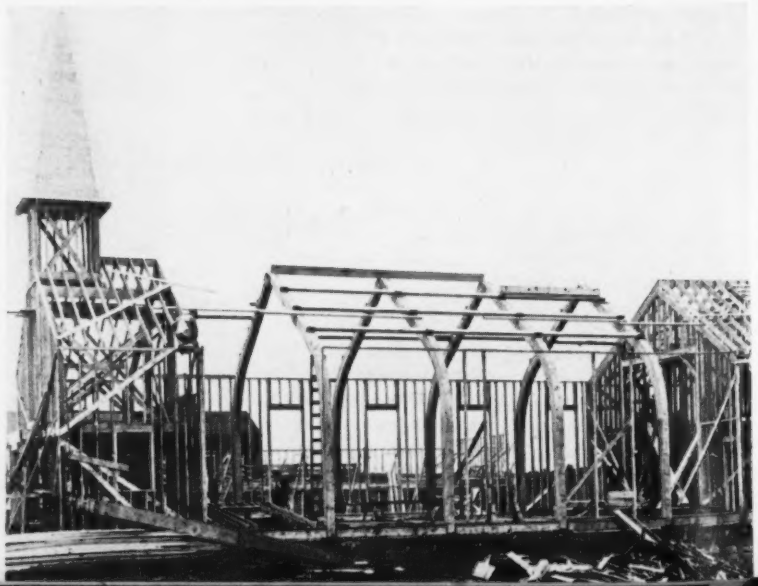
Scarcity of steel resulted in the use of glued laminated beams of 67-ft. span for a gymnasium at Seattle. Each beam is 14 in. wide by 40 in. deep, and built up of 3,900 bd.ft. of 2x4-in. and 2x10-in. seasoned lumber. Two species of wood were used; Douglas Fir for the outer edges of the beams, where the stresses are higher, and Sitka spruce for the inner portions. Lumber was joined by casein glue and 20-d. nails. (July 16, 1942, p. 97).

Drill hall with 120-ft. span at a Navy training center in Maryland is framed with glued, laminated, timber arches. The ribs were fabricated in two sections, each 74 ft. long, at a mill in Wisconsin and shipped by rail.



Hangar for large Navy seaplanes, which has a concrete roof supported by massive two-hinged arches with end ties extending under the floor. A clear height of 70-ft. is provided and the span is 270 ft. center to center of haunches. The lean-to structure provides shop and office space at each side.

Further versatility of timber construction is to be seen in the use of these laminated timber arches for military chapels. These Gothic type arches have 37-ft. span and a rise of 26 ft. 9 in. Laminations in the arch members were made with scarfed ends, glued together and later milled, making each lamination continuous for the entire length of the curved member. The lumber used was 1x10-in. material. (ENR, Oct. 29, 1942, p. 599).

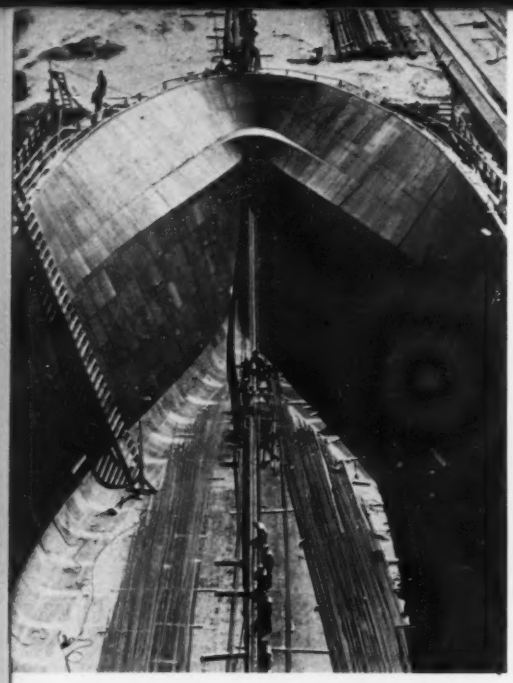


Five thousand houses in five months was the record achieved to provide homes for workers at an East Coast shipyard. Each piece in a structure —every board, every length of pipe, every electrical facility—is made up in advance and assembled to the largest unit that can be readily handled manually. The structure is the design of the Homasote Co., who manufacture an insulating board extensively used in the houses. (Aug. 13, 1942, p. 212.)

Structural tile was used on a mass scale for the first time in cantonment construction on a camp for the WAACS at a Midwest army post. In two months 112 buildings were constructed to provide attractive and semi-permanent quarters for 3,150 women at a cost only six percent greater than for wood construction. Walls were of hard-burned 4x5x12-in. and 8x5x12-in. tile with a 1-in. air space between. Roofs are frame with slate-covered asphalt shingles. (Dec. 17, 1942, p. 838.)

Here is an alien internment camp, U. S. style. This picture illustrates another miracle achieved by the construction industry. The complete camp, containing 475 "hutments", 43 barracks, 10 bathhouses, 10 latrines, 7 mess halls, was completed in 23 days. (Sept. 10, 1942, p. 358.)

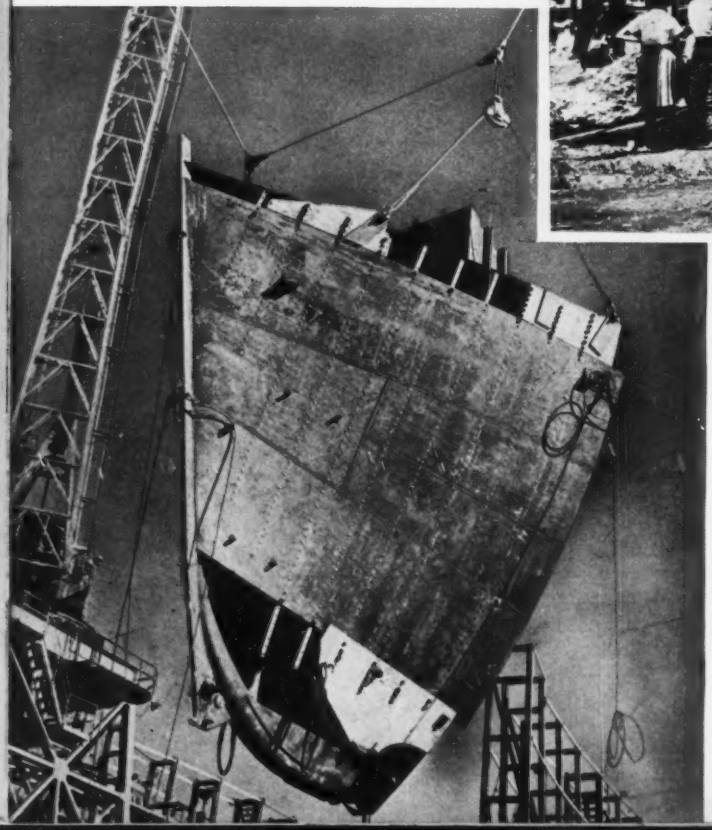
Single wall system of house assembly is one of the most recent developments in war housing. Erection system is based on the use of vertical, single-wall, prefabricated panel units made of 1-in. rigid insulation board covered on both sides with plywood.



Concrete barges of 50-000-bbl. cargo capacity are being built for the Maritime Commission in Pacific Coast shipyards with prefabricated plywood forms assembled in sections weighing as much as 12½ tons. Built in an open air "mold loft," the sections are moved bodily to the construction dock and assembled as above. When this picture, which is looking toward the stern was taken, the longitudinal reinforcing was being pulled through a hole at that end. Barge will be 375 ft. long and of 56-ft. beam. (Dec. 31, 1942, p. 902.)

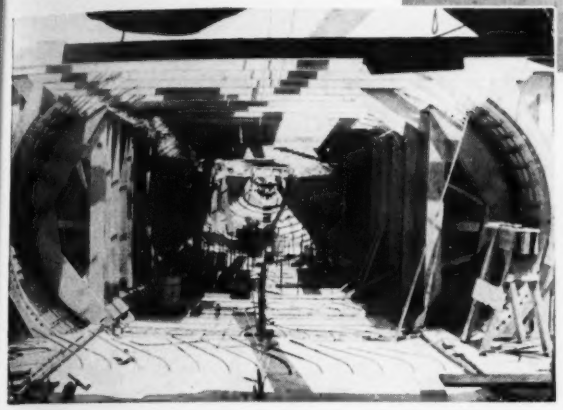
Unbraced, hollow steel columns on a 110-ft. spacing were used at a shipyard to support overhead crane girders 95 ft. apart and designed to carry a 165,000-lb. moving load. The columns are 93 ft. high, 8 ft. in diameter, and made of steel plates varying in thickness from $\frac{1}{16}$ in. at the top to ½ in. at the bottom. Use of the columns permitted pile foundations constructed 25 years ago to be employed for construction of ships of greater width than those for which the ways were first planned. (Feb. 26, 1942, p. 324.)

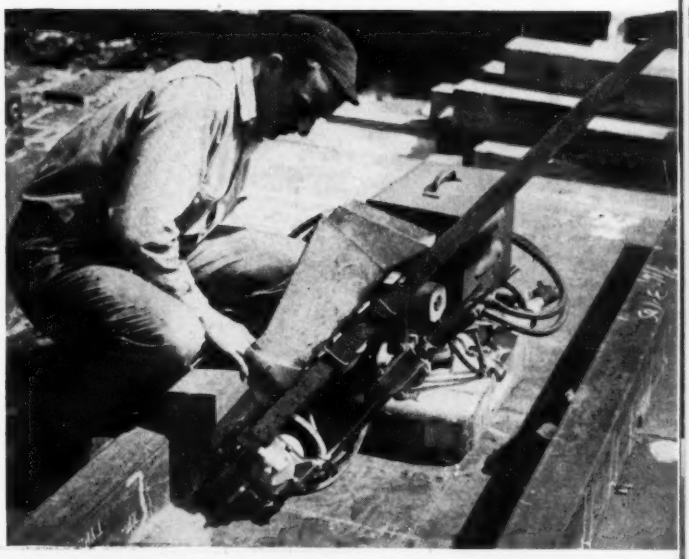
To speed war production, the DeFoe Shipbuilding Co., Bay City, Mich. constructed hulls of small naval vessels upside down in special cradles that permitted hull to be turned upright for the remaining operations. (April 16, 1942, p. 585.)



Shortcuts and new methods of handling material, introduced largely by construction men, account for the many new records in shipbuilding. An example of the techniques employed is shown by this picture of the preassembled forepeak of a ship, which is picked up bodily and carried to the ways, where it will be added to other previously assembled units. This preassembly weighs about 60 tons. (July 16, 1942, p. 85.)

The Phantom, an experimental concrete ship, was designed specifically to take advantage of the properties of concrete in making a molded, streamlined hull that would provide a high strength with a minimum of concrete and reinforcing. It is suggested as a possible prototype of a 260-ft. 2,000-ton tanker with a 36-ft. beam and 27-ft. depth. The ship pictured is 91½ ft. long, has a 14-ft. beam and a total depth of 7 ft. Photograph below shows the ellipsoidal cross section of the structure as it appeared during construction. (Jan. 7, 1943, p. 8.)

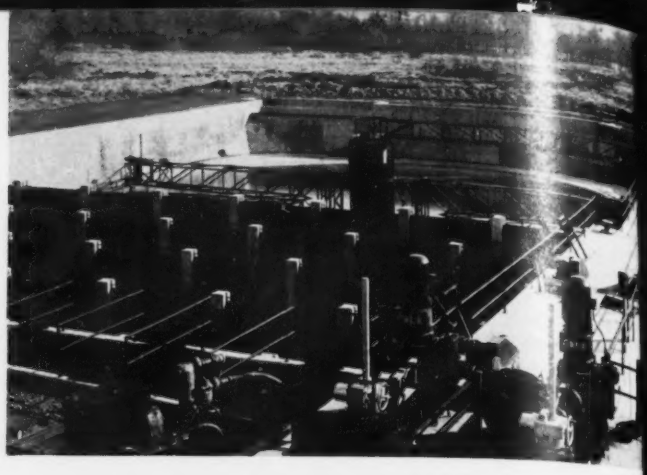




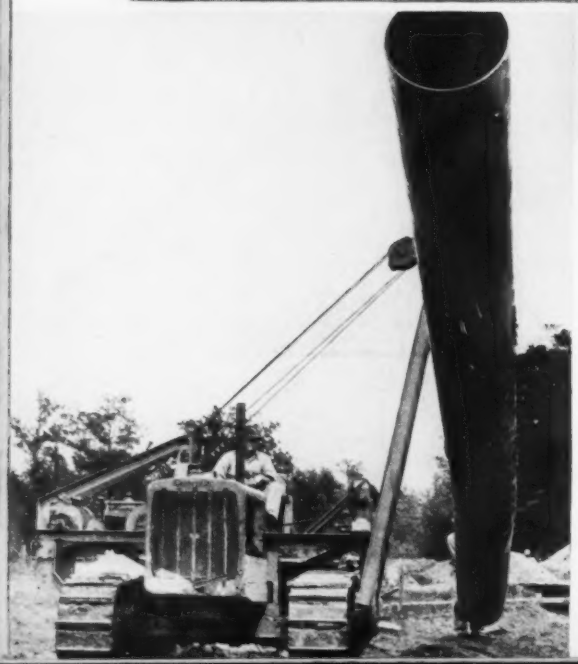
An important factor in the rapid construction of the 10,500-ton Liberty cargo vessels was the introduction of automatic welding machines to replace slower manual units. At one yard machines of the type above, which make a single pass on each side, are used for three-fourths of the butt welds for plates ¼ to ¾ in. thick. The electrode is copper-coated and is constantly covered with a granulated welding flux. Traveling under its own power, the machine feeds electrodes and flux. (Sept. 24, 1942, p. 426.)

The year 1942 also brought a number of disasters, including the capsizing of the French Liner Normandie at New York City Feb. 9. When the photograph at right was taken in October, the upper decks had been removed and workmen were busy on preliminary operations to right the ship by controlled pumping (Oct. 22, 1942, p. 533).

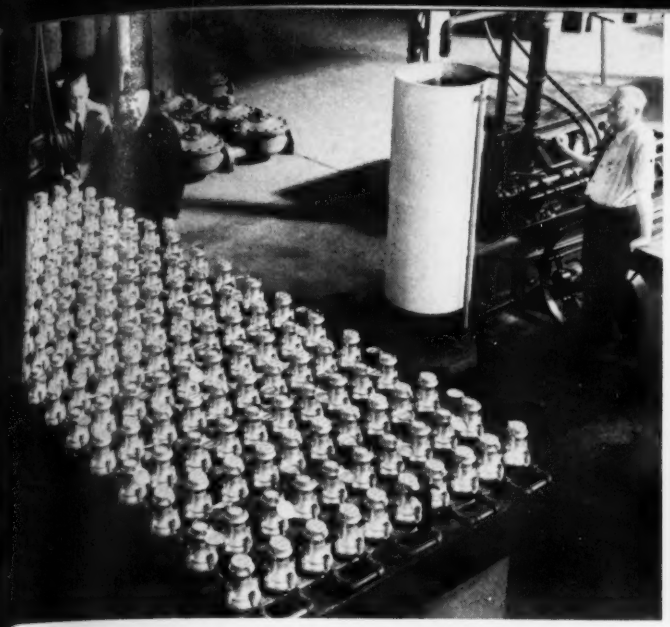
Making sewage plant effluent suitable for an industrial water supply is the function of this treatment plant recently installed at an east coast steel mill. The steel mill negotiated with a nearby municipal sewage treatment plant for the purchase of about 40 mgd. of its effluent because depleted ground-water supplies were not sufficient to carry on steel processing. The treated effluent from an activated-sludge plant is brought 4 miles to this processing plant, where additional chemical treatment will make the effluent suitable for industrial uses.



An unusually pleasing design for a 2,500,000-gal. water tank was developed by the Chicago Bridge & Iron Co. for Tulsa, Okla. Beauty as well as function are served by the use of deep exterior ribs on this all-welded steel tank. Not only do the ribs break up the large surfaces, but they aid in supporting the ellipsoidal dome and ornamental cupola. One of the ribs incloses a 15-in. dia. overflow pipe and another ladder. (April 23, 1942, p. 614.)



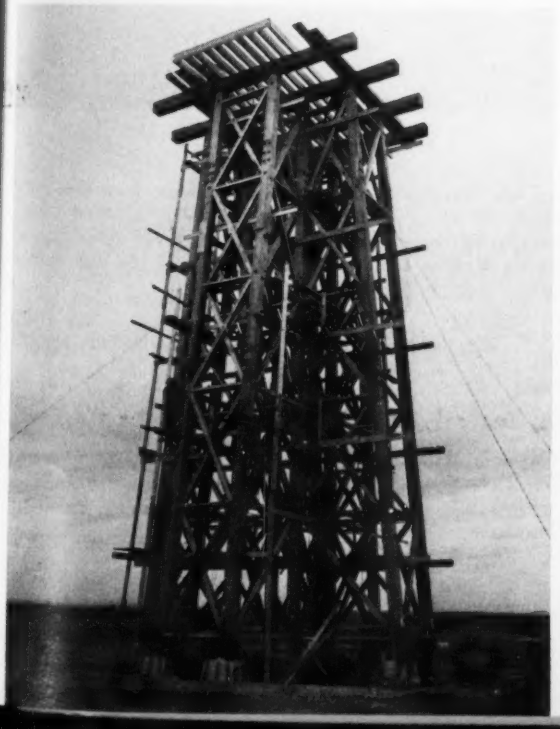
Most spectacular of all pipeline jobs is the "Big Inch", a War Emergency Pipelines, Inc. project now being built from the Texas oilfields to refineries on the Atlantic seaboard. With a main length of 1,250 miles and a diameter of 24 in., it ranks as the largest pipeline ever designed to carry crude oil. Rolled in sections some 40 ft. in length, each piece of pipe weighs close to 2 tons. (Dec. 31, 1942, p. 915.)



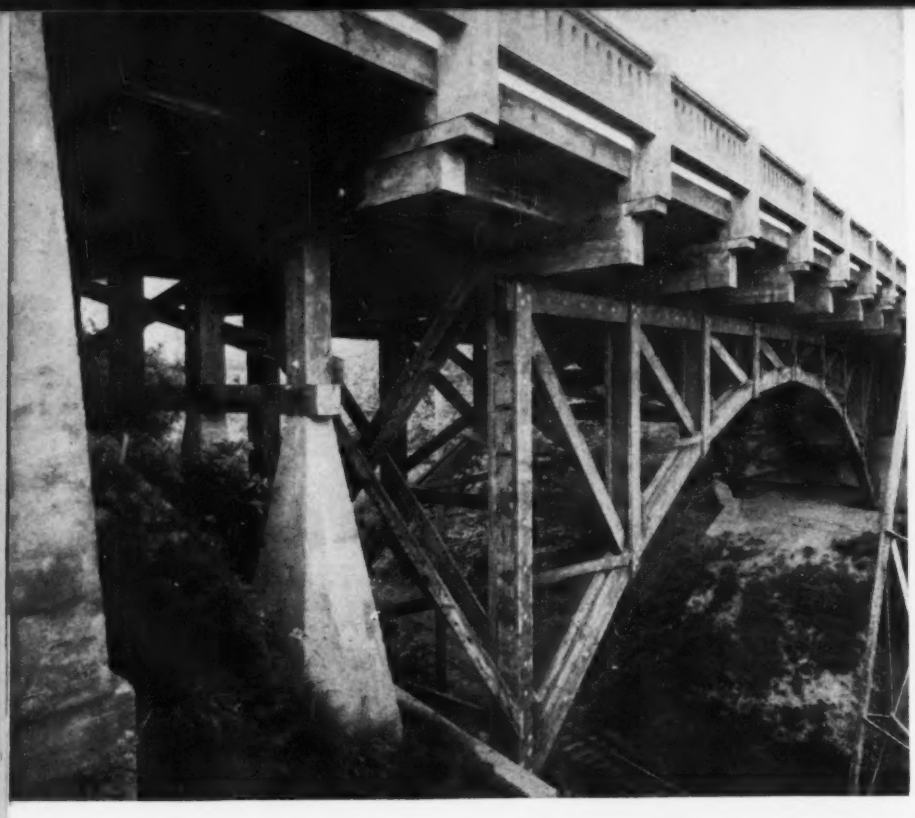
Speed-up is the order of the day, even in the field of water meter testing. The Los Angeles department of water and power developed this testing bench, which handles 160 meters at a time instead of the former limit of ten. Meters are connected in series and the accuracy of individual meter registration is determined after a flow of 10 cu. ft. (measured in tank at right) passes through the bank of units. (Sept. 10, 1942, p. 375.)

With the use of the equipment pictured above, a well at one of our Army ordnance plants was treated with acid as a result of which the flow was quadrupled. Treatment of the well with inhibited hydrochloric acid dissolved portions of the rock, thus enlarging the pores through which the water flowed more readily into the well. The application of the process is relatively new in the water supply field. (Aug. 13, 1942, p. 232.)

A 50,000-gal. elevated water tank required in a hurry at a Pacific Northwest military camp was made available on time by use of a timber tower. To support the tank 60 ft. above ground level, 12x12-in. timbers were used for the main members, which were anchored to concrete pier foundations. The several bents were framed on the ground and erected by means of a gin pole. (Jan. 28, 1943, p. 143).



Manhole covers at Los Angeles were made from 2x4x8-in. laminated wood strips with 20d. nails to save steel. Wear on the cover is reduced by laying strips at 45-deg. angle to line of traffic and by applying a thin coating of emulsified asphalt and dry sand to top surface. County surveyor Alfred Jones is shown explaining details of the cover to an interested pedestrian.

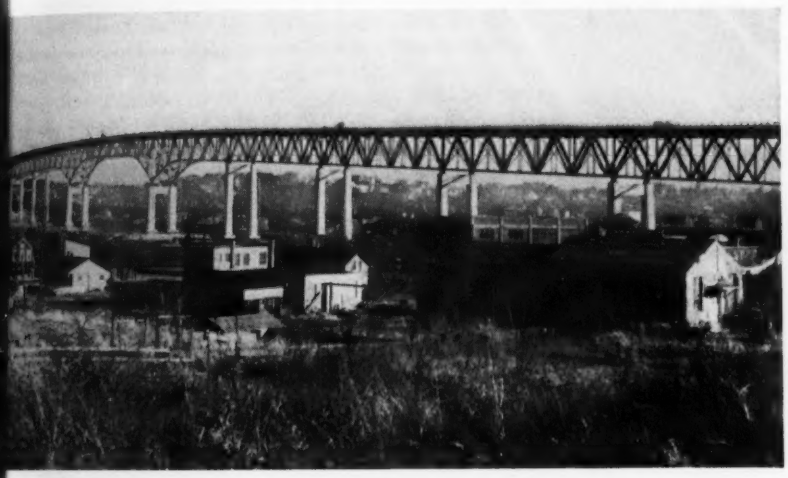


Throughout the nation in 1942 many timber bridges were constructed to save steel. This Portland, Ore., structure has three-hinged timber trusses of 88-ft. span which are spaced 18 ft. apart. They support a 24-ft. roadway designed for an H15 loading and two 3-ft. sidewalks. The parabolic lower chord of the trusses has a rise of 18 ft. and the trusses are 21 ft. deep at the seat and 3½ ft. deep at the crown. The floorbeams rest on the upper ends of the verticals and the deck is 4x10-in. plank surfaced with a 2-in. asphaltic concrete. The crossing was built by Multnomah County.

To save steel, a Brazos River bridge in Palo Pinto County, Texas, west of the town of Mineral Wells, was built of native stone. It is 440 ft. long, including nineteen arch spans, and provides a 24-ft. roadway. The crossing, which was built as a part of a 25-mi. WPA road construction project, serves Texas State Highways 16 and 254. (ENR, July 16, 1942, p. 75).

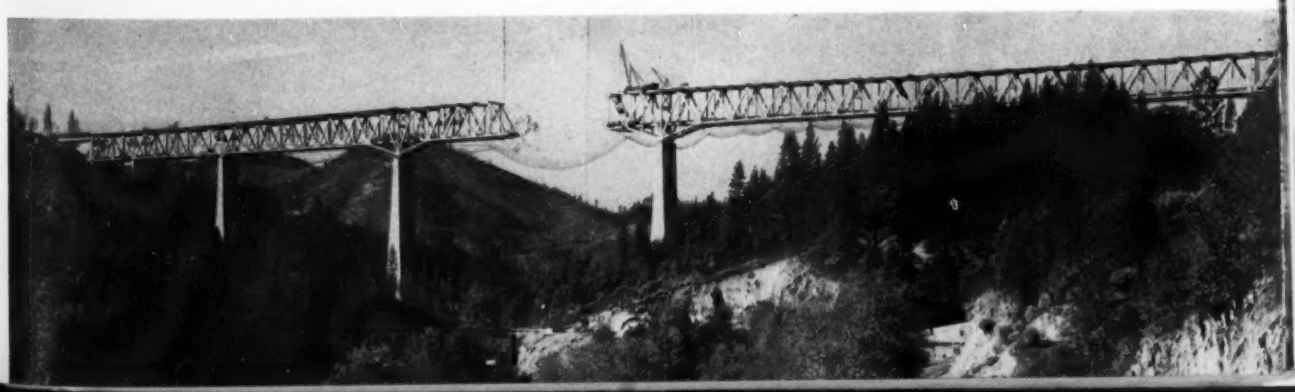
This Mississippi River crossing at Dubuque, Iowa, is uncommon for two reasons: (1) the 3-span, continuous-truss tied-arch structure has only one other counterpart in the United States; and (2) at no point do the trusses rest on fixed shoes, rocker arms being used at the ends of the bridge and ordinary expansion rollers under the trusses at the intermediate piers. To carry the longitudinal wind and traction loads, a large steel pin is embedded in the middle of the pier at the east end of the arch to extend up into the floorbeam at that point. (Aug. 27, 1942, p. 296).

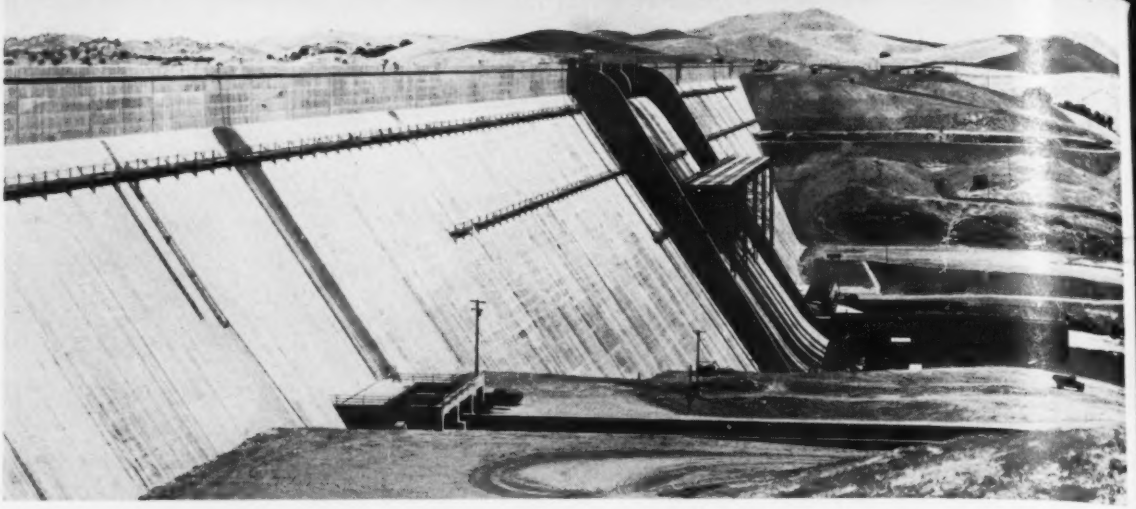
Hartford (Conn.) bridge, which contains the longest plate girder span in the United States, provides a new crossing of the Connecticut River and is a link in the Wilbur Cross Parkway. The main river crossing is a 270-300-270-ft., three-span, continuous-girder unit. The long silicon steel plate girders are 17 ft. deep over the piers and 11½ ft. elsewhere. Total length of the bridge is 3,950 ft., and it was opened to traffic on Sept. 5. The roadway cross-section consists of two 24-ft. roadways, separated by a 4-ft. wide center mall and flanked on the outside by 4-ft. sidewalks. (Sept. 10, 1942, p. 338.)

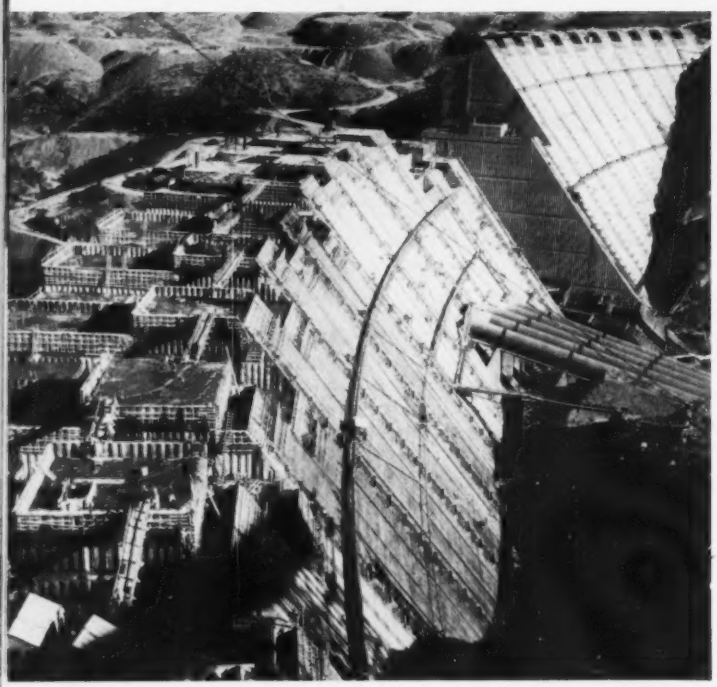


Soon to be opened to traffic is the Groton crossing over the Thames River at New London, Conn. The structure is 5,926 ft. long and consists of a 1,245-ft. cantilever with a 540-ft. main span, also 2,500 ft. of deck truss spans and 2,181 ft. of deck girder approaches. To provide a high-level crossing over the navigable channel, the bridge will have a clear height of 137.5 ft. above mean low water. (Sept. 18, 1941, p. 399.)

Late in 1942 the top deck of the Pit River Bridge over an arm of Shasta Dam Reservoir was completed for highway traffic to mark completion of this record-height double-deck structure; trains of the Southern Pacific's San Francisco-Portland route started using the lower deck months earlier. The structure required piers 350 ft. high, the tallest in the world. The main structure is 2,753 ft. long, including a cantilever with a 630-ft. central span and 497-ft. side spans. Total length of the bridge is 3,587 ft. (April 2, 1942, p. 517.)



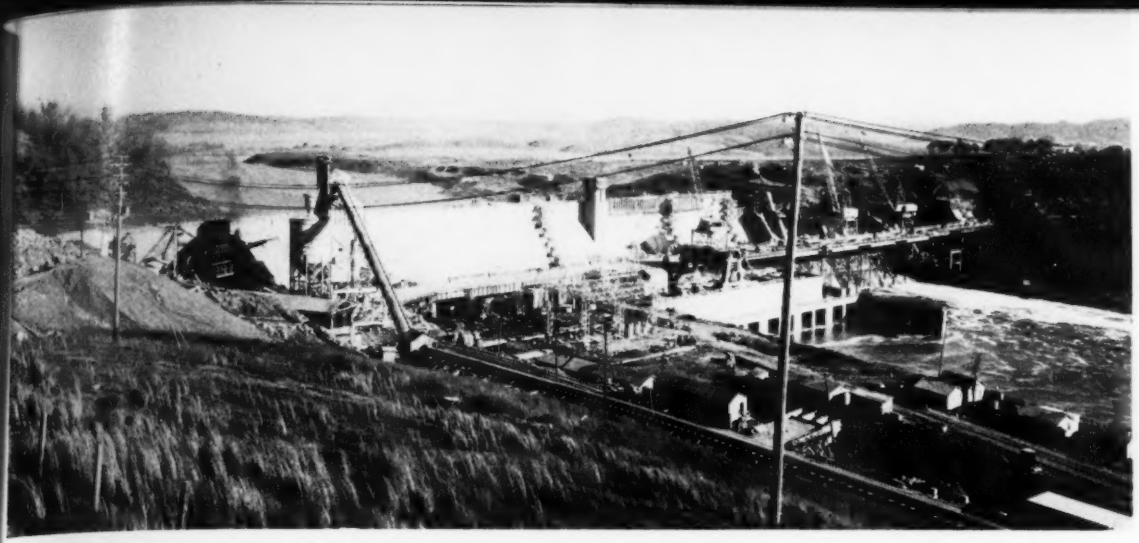




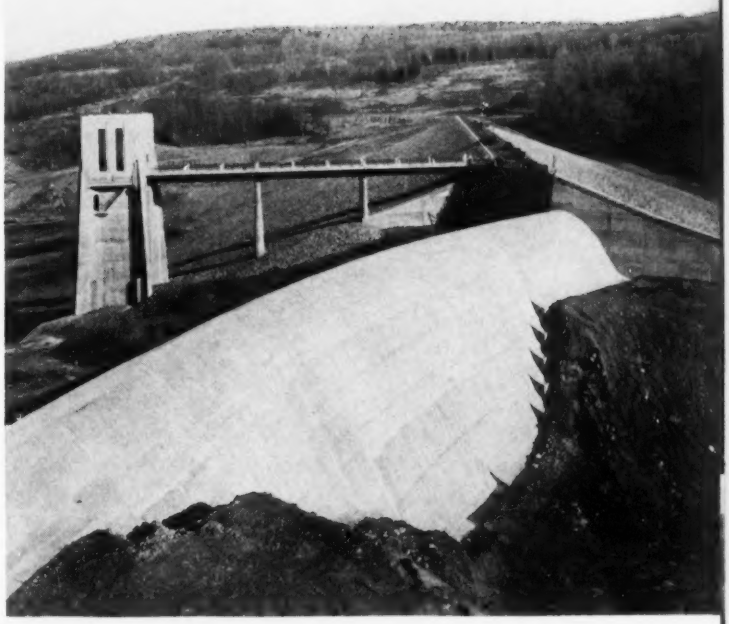
Friant Dam (above), which is exceeded in size only by Boulder, Grand Coulee, and Shasta dams, was completed last year. Built by the Bureau of Reclamation on the San Joaquin River in California at a cost of $10,000,000, the structure is 325 ft. high, 3,340 ft. long and contains 2,200,000 cu. yd. of concrete. The dam, a part of the Central Valley project, creates a 520,000 acre-ft. reservoir.

With one-half of the 6,000,000 cu. yd. of concrete required in place as early as April, 1942, Shasta Dam is rapidly becoming the second largest masonry dam in the world. This $103,000,000 project is also a part of the Central Valley development. The dam, and a powerhouse, which will house five 75,000-kw. generators, are to be completed in 1944.

Construction of Youghiogheny Dam (below) in southern Pennsylvania by the U. S. Engineers is uncommon in that a belt conveyor is being used to place the fill material directly on the structure. To aid in protecting Pittsburgh from floods, the dam will be 184 ft. high and require about 3,000,000 cu. yd. of fill. (Dec. 3, 1942, p. 777.)



To be closed in the short time of thirteen months from start of construction, Douglas Dam (above) was begun Feb. 2, 1942 and the river diverted through the closure blocks on Dec. 13, 1942. Douglas Dam is being built on the French Broad River in Tennessee by the Tennessee Valley Authority at a cost of $30,000,000. It is 150 ft. high and 1,680 ft. long.



Knightsville Dam (right) on the Westfield River near Huntington, Mass., was completed by the U. S. Engineers early in the summer. To store floodwaters, the 1,200-ft. hydraulic fill dam rises to a height of 160 ft. above the river bed. The concrete ogee spillway is 400 ft. long. (ENR, July 30, 1942, p. 142.)

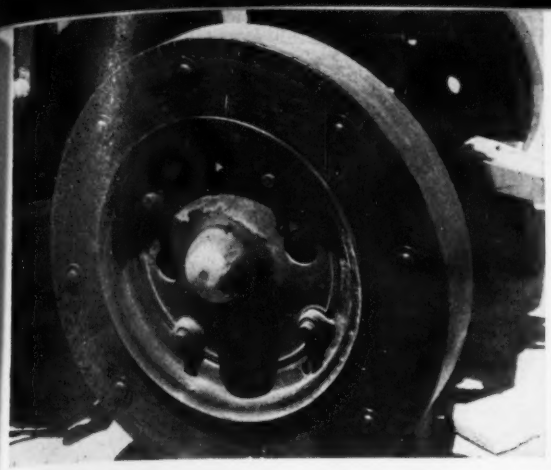
With construction of the cut-off trench well advanced, as shown in the middle ground of the picture below, the Anderson Ranch Dam project on the South Fork of the Boise River near Boise, Idaho, was shut down late in 1942 by a War Production Board order (ENR Dec. 3, 1942, p. 756.) When complete, the structure will be an earthfill 1,350 ft. long and of 330-ft. maximum height.

Somewhere on the Atlantic Seaboard the Public Roads Administration in July completed for the Army's Air Corps the nation's first flight strip. Suitable for the Army's heavy bombers, it is 8,000 ft. long by 500 ft. wide; the concrete runway is 150 ft. wide and 7,000 ft. long. The strip was constructed in the fast time of 57 days, although heavy grading totalling 213,000 cu. yd. was required. (July 9, 1942, p. 62 and Jan. 29, 1943, p. 128.)

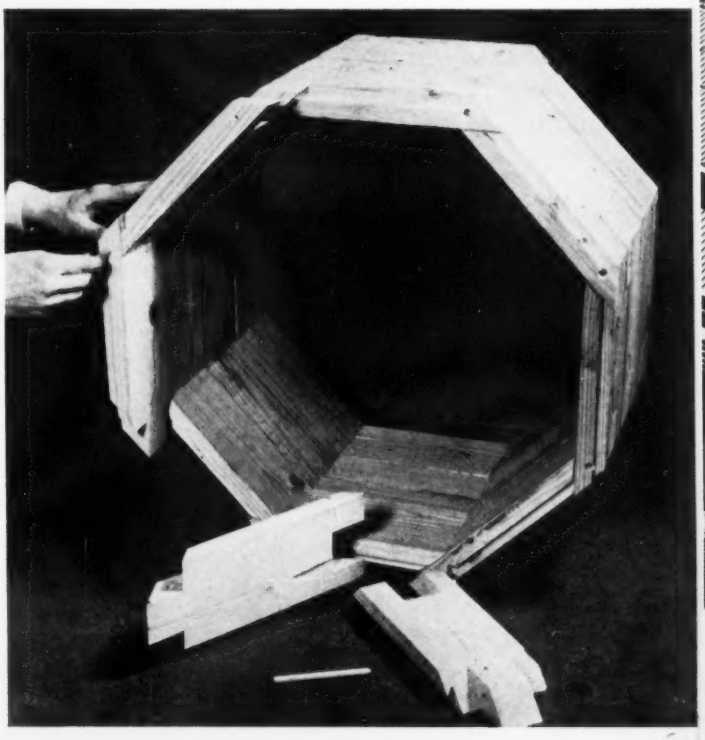
At a number of airbases where soil-cement runways were built, bulk cement hauling units (once used in the petroleum industry) proved of great advantage. Each truck was of 600-bag capacity. A spreader on the rear of the truck permitted distribution in the desired thickness over a 3-ft. width. Two screw conveyors in the distributor truck provided continuous delivery of cement to the spreader. Moving ahead at a rate of 1.5 mph., the unit could spread cement for 2,450 sq.yd. of pavement hourly. (Sept. 10, 1942, p. 366.)

One of the year's greatest construction achievements was completion of the Alcan highway to provide a gravel-surfaced route from Dawson Creek, British Columbia, to Fairbanks, Alaska. Officially dedicated Nov. 20, the 1,670-mi. road was built in less than a year to service airports in Canada and to provide a highway connection to Alaska. Pictured are the "cat skinners" who met to close the last gap in the pioneer road. (Dec. 17, 1942, p. 870.)

A new type of pavement combining lead and zinc mine wastes (chats) with small quantities of portland cement and silty soil was built by the Tulsa district, U. S. Army Engineers. Construction methods are similar to those for soil-cement pavements. In paving a 285,000-sq.yd. automobile parking field, the chats were combined with 12 percent by volume of ordinary portland cement and 5 to 15 percent of black silty soil classified as A-4 by PRA standards. (June 18, 1942, p. 985.)



To conserve rubber, Bureau of Reclamation engineers at the Parker Dam project have mounted portable construction equipment on tires made of wood and of reinforced concrete. Shown here are laminated wood tires on a portable concrete mixer. The segments are placed to break joints and the treads are protected by metal strips nailed to the tire wall.



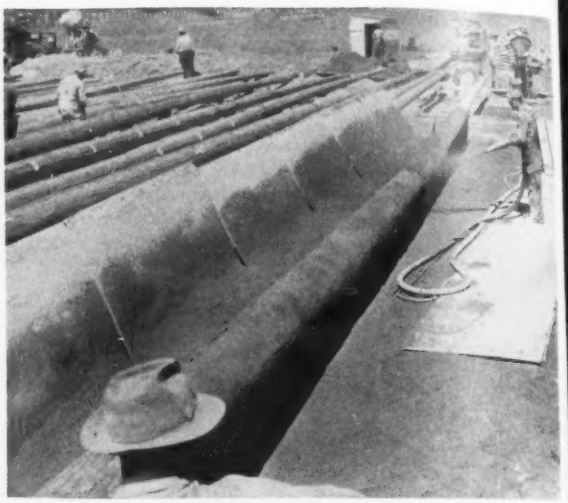
One of many new products introduced in 1942 to save steel included a sectional wood culvert designed by Armco Drainage Products Association. Octagonal in shape, pipe is fabricated from various sizes of lumber, according to diameter and load requirements, and fastened together with wood dowels. (April 9, 1942, p. 540.)

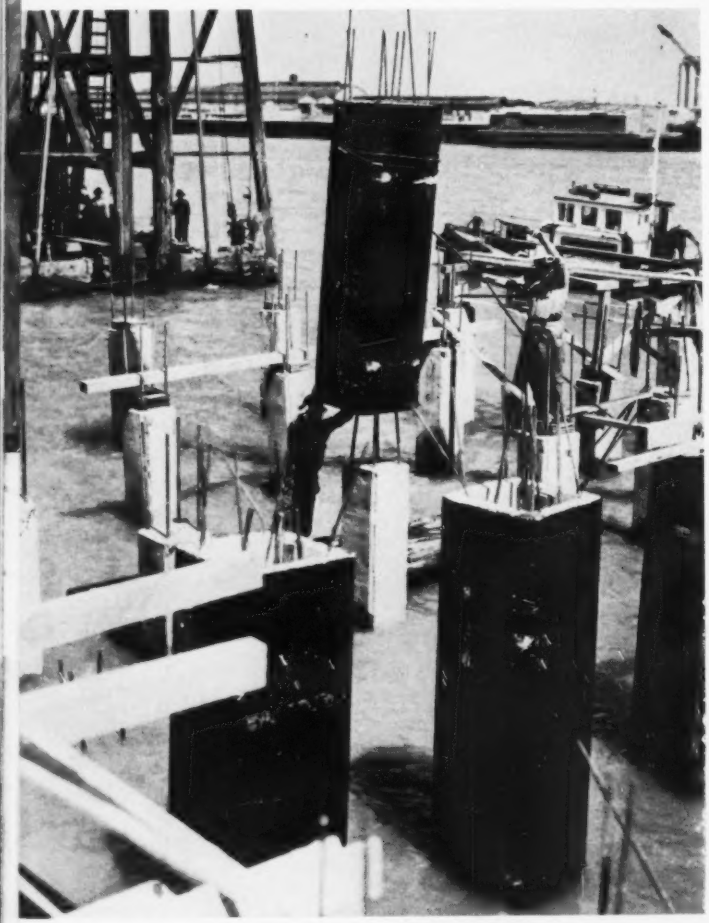
A national campaign to obtain 17,000,000 net tons of scrap metal to fulfill demands of mills producing steel for war resulted in many unusual contributions. The above 10,000-lb., horse-drawn, tricycle roller, a museum piece, was one contribution of the Austin-Western Co., Aurora, Ill.

When it was found that electricians wiring military barracks at Fort Lewis, Wash., traveled one-half mile daily climbing up and down stepladders, foremen of the Electric Construction Co. supplied the men with stilts. Much faster work resulted with less labor. (Nov. 12, 1942, p. 675.)

Delayed several weeks on a Pittsburgh street project by steel priorities, the Ben Construction Co. designed and built concrete manholes reinforced with a minimum of ½-in. bars. As a result, an urgently needed project was completed much sooner than otherwise would have been possible

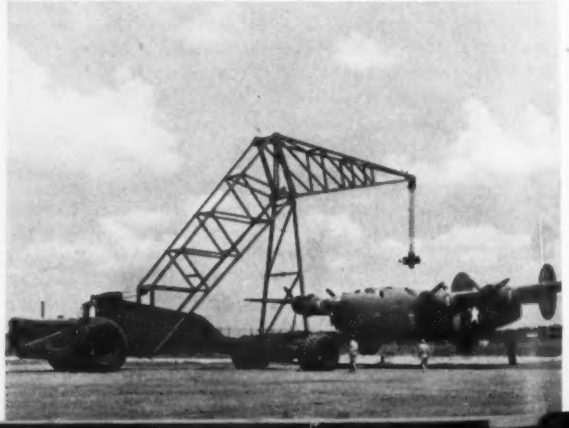
A sand-cement protective coating around long, untreated wood piling was developed by the U. S. Engineer Department for a rush pier job when there was available neither creosoted-treated piling nor equipment for driving long reinforced concrete piles. Reinforcement for the protective coating consisted of 2x2-in. welded steel wire mesh. (Nov. 5, 1942, p. 624.)





Precast concrete jackets (left) were used to compensate for unequal pile lengths when it was impossible to determine in advance the exact length of reinforced concrete piles to support a heavy pier. The jackets were square, with an opening of 20 in. The thickness of the jacket was 4 in. and its length about 10 ft. They were slipped over the 18-in. square concrete piles and were fastened to the proper height by means of a timber frame on which they rested. After they had been set to the proper height, they were grouted in place. Not only was this a simplified and inexpensive method for compensating for difference in driven depth, but the larger top area gave a wider bearing on which to support the deck beam. (Oct. 22, 1942, p. 544.)

In 1942 a giant mobile crane capable of lifting 35 tons was built to specifications provided by the Army Air Corps. It is planned for use in quickly moving heavy equipment on the field. The crane complete weighs 130,000 lbs., much of its weight being taken up by a huge metal counterweight behind the 200 hp. supercharged, diesel engine. Official capacity rating of the machine is 30 tons, but in tests the crane lifted 35 tons. (Dec. 3, 1942, p. 759.)



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CONTRACT UNIT PRICES

What contractors are bidding on different kinds of construction work

HIGHWAY BRIDGE, TEXAS

OWNER: Texas State Highway Commission, Austin.

PROJECT: Construction of reinforced concrete and steel bridge across the Leon River, approximately two miles north of Belton, Bell County, Tex., on Highway No. 317. Project length 0.136 miles.

CONDITIONS: Contractor furnishes all materials. Rail and highway transportation facilities available. Prevailing wages to be paid.

BIDS: Ten bids were received December 15, 1942, ranging from the low of $122,253 to $169,767.

LIST OF BIDDERS:

1. C. H. Harrison, Waco, Tex. (low bidder) $122,253
2. Wallace & Bowden, Dallas, Tex 127,259
3. Ernest Loyd, Fort Worth, Tex 128,790
4. Ben Sira & Co., Dallas, Tex 134,157
5. Cage Bros. & Turner, Bishop, Tex 140,155
6. M. E. Worrell, Austin, Tex 146,101
7. Austin Bridge Co., Dallas, Tex 149,253
8. Southern Contracting Co., Austin, Tex 155,997
9. Standard Paving Co., Fort Worth, Tex 168,771
10. Dean Word, San Antonio, Tex 169,767

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Clearing and grubbing	2.9 ac.	$150.00	$200.00	$200.00
2. Unclass. struct. excav	1,901 c. y.	4.00	6.00	6.00
3. Class A conc. (girders and slab)	1,143.5 c. y.	28.50	25.00	27.00
4. Class A conc. (bents)	389.2 c. y.	22.50	25.00	27.00
5. Class A conc. (piers)	732.6 c. y.	24.50	28.00	27.00
6. Class B conc. (caissons)	52 c. y.	15.50	16.00	27.00
7. Class E conc. (seal)	87.6 c. y.	17.00	18.00	27.00
8. Reinforcing steel	339,055 lb.	.055	.055	.06
9. Structural steel	15,060 lb.	.20	.18	.12
10. Cast steel bearing plates	11,560 lb.	.25	.30	.22
11. Remove old structures	Lump Sum	7,500.00	4,000.00	2,750.00
12. 15-in. sq. precast conc. piling	2,630 l. f.	4.00	5.25	4.50
13. Special railing	1,440 l. f.	2.55	3.00	3.00

HIGHWAY, PENNSYLVANIA

OWNER: Pennsylvania State Highway Dept., Harrisburg. T. C. Frame, chief engr.

PROJECT: Concrete and relaid brick paving 17,497 feet of Traffic Route 930 in Aliquippa and Monaca Boros, and Hopewell and Center Townships, Beaver County, Pa. Involves construction of approximately 17,487 feet of cement concrete paving 33 feet and varying in width; 10 linear feet of relaid brick pavement, varying in width; clearing and grubbing; excavation; drainage structures; curbing; and retaining wall.

CONDITIONS: Contractor to furnish all materials except salvaged structural steel for retaining wall, and complete project in 290 calendar days. Rail and highway transportation facilities available. Wage rates specified are: skilled labor, 75c. per hour; semi-skilled 55c.; and common, 50c.

BIDS: Four bids were received January 22, 1943, ranging from the low of $1,018,969 to $1,544,571.

LIST OF BIDDERS:

1. S. J. Groves & Sons Co., Ridgefield, N. J. (low bidder) $1,018,969
2. Bero Engr. & Constr. Corp., Buffalo, N. Y. 1,392,377
3. Ralph Myers Constr. Co., Salem, Ind 1,405,800
4. Dinardo, Inc., Pittsburgh, Pa 1,544,571

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Clearing and grubbing	Lump Sum	$20,000.00	$10,000.00	$23,000.00
2. Class I excavation	844,395 c. y.	.77	1.20	1.21
3. Class II excavation	4,692 c. y.	3.00	2.50	3.25
4. Subgrade	70,958 s. y.			
5. Shoulders	14,045 l. f.	.20	.25	.20
6. Natural stone, type B; or crushed aggr. base course, 6-in	4,539 s. y.	1.25		.25
7. As above, 8-in. depth	1,998 s. y.	1.75		1.60
8. Selected material, surfacing	645 c. y.	3.00		1.95
9. Reconditioned base course mat'l	8 c. y.	7.00		6.50
10. Cement conc. base crse., type A, for pipe trench replacement	3 c. y.	30.00		4.50
11. Plain cem. conc. base crse., type A, 8-in. depth	75 s. y.	3.30		18.00
12. Plain cem. conc. pavmt., 6-in. depth	28 s. y.	3.00		3.20
13. Cem. concrete pavmt., 9-in. depth	64,318 s. y.	3.10		3.10
14. Relay block pavement	83 s. y.	3.00		3.30
15. Bitum. surface crse., AT-1	5,309 s. y.	.70		3.50
16. Bitum. surface crse., CP-2, 2-in. depth	1,075 s. y.	.95		.60
17. Class B concrete	455 c. y.	30.00		1.10
18. Plain steel bars	120 lb.	.12		35.00
19. Stone backfill for misc. drainage	4 c. y.	8.00		.10
20. Stone backfill for structures	30 c. y.	8.00		4.50
21. Cement rubble masonry	22 c. y.	22.00		4.50
22. Type A tree walls	22 c. y.	20.00		25.00
23. Plain stone slope wall	22 c. y.	18.00		40.00
24. Grouted rubble paving, stream beds, 6-in. thick	9 c. y.	20.00		25.00
25. Manhole	1 ea.	250.00		35.00
26. Type E inlet with curtain walls	1 ea.	250.00		200.00
27. Type E inlets	3 ea.	175.00		150.00
28. Double E inlet	1 ea.	300.00		150.00
29. City of Pittsburgh storm inlet, type 5	2 ea.	300.00		200.00
30. Reset manhole castings	1 set	75.00		250.00
31. 15-in. rein. concrete pipe	2,204 l. f.	3.25		50.00
32. 18-in. rein. concrete pipe	1,762 l. f.	4.00		3.00
33. 24-in. rein. concrete pipe	350 l. f.	5.50		3.75
34. 42-in. rein. concrete pipe	166 l. f.	14.00		4.50
35. 24-in. vertical rein. conc. pipe	84 l. f.	50.00		12.00
36. 15-in. plain cem. conc. or vitr. clay pipe	246 l. f.	3.25		5.50
37. 18-in. as above	204 l. f.	3.50		2.75
38. Relay 15-in. rein. conc. pipe	32 l. f.	3.00		3.50
39. Relay 18-in. rein. conc. pipe	74 l. f.	4.00		2.50
40. Relay 24-in. rein. conc. pipe	20 l. f.	5.00		2.50
41. Relay 18-in. corr. metal pipe	39 l. f.	4.00		3.00
42. 6-in. tile underdrain	13,680 l. f.	1.15		3.00
43. 6-in. T.-F. underdrain, type B	9,954 l. f.	1.15		1.15
44. 6-in. tile outlets	2,361 l. f.	.80		1.00
45. 8-in. tile outlets	170 l. f.	1.00		.90
46. Coarse aggregate for ext. depth tile underdrain	265 c. y.	3.25		1.00
47. Subgrade drains	4,090 l. f.	.65		4.00
48. Plain rubble gutter	295 s. y.	4.00		.50
49. Grouted rubble gutter (seg.)	230 s. y.	4.50		5.00
50. Plain cem. concrete gutter	4,385 s. y.	3.25		8.50
51. Plain cem. conc. curb, type A	320 l. f.	1.75		4.50
52. Guard posts	1,283 ea.	3.00		2.00
53. Treated lumber; wooden floors, etc.	23.3 Mbm.	200.00		6.00
54. Place salvaged struct. steel in retaining wall	Lump Sum	500.00		225.00

RAIL REMOVAL AND RESURFACING STREETS, SEATTLE, WASH.

OWNER: Board of Public Works, Seattle, Wash.; C. Wartelle, city engineer.

PROJECT: Removing street railway tracks, and resurfacing Fremont Avenue and North 34th Street, Seattle, Wash. Length of rail to be removed is 30,160 feet.

CONDITIONS: Contractor to furnish all materials and complete work in 60 days. Rail and water transportation facilities available to the city, and highway at site of work. Wage rates are: skilled labor, $2.00 per hour; semi-skilled, $1.50 and common, $1.10. No priority rating needed for job. Certificate of necessity granted for necessary asphalt.

BIDS: Only one bid was received on September 17, 1942, from Argentieri & Colarossi, Seattle, Wash. The amount was $29,983. Awarded to above company.

Item	Quan.	Unit Bid Price
1. Remove asphalt or brick surfacing	15,550 s. y.	$0.50
2. Remove street railway rails	30,160 l. f.	.15
3. Furn. Class "1.25" concrete for variable thickness pavmt. on existing base	117 c. y.	8.00
4. Constr. concrete pavement, variable thickness, on existing base	550 s. y.	.55
5. Concrete base in rail voids	140 c. y.	8.00
6. Concrete base, variable thickness	2,150 c. y.	8.00
7. Adjust manholes, etc.: covers	22 ea.	7.00
8. Adjust monument cases	1 ea.	7.00
9. Monument cases	14 ea.	20.00

—Rapidly approaching the 2000 mark!

CORBETTA *Beehive* TYPE UNDERGROUND MAGAZINES

Dome-shaped Design Speeds Construction Saves Materials, Manhours and Money!

Important Savings, To Date

The Corbetta BeeHive Design is responsible for saving approximately:

31,510 Tons Reinforcing Steel

552,200 Barrels Cement

772,000 Tons Concrete Aggregates

2,573,000 Manhours

Savings in materials released **21,310** Freight Cars for other vital war needs

This thin-shell BeeHive type of storage magazine (also known as an "Igloo") was designed for . . . speed and economy in construction, efficiency of operation and freedom from condensation. Its 8" circular floor slab (44' and 52' diameters) serves as a spread footing—permits this type of structure to be built on the poorest bearing capacity soil.

Time saving construction methods enabled the pouring of as many as 60 domes in a single twenty-four hour period—while on one 800 unit project, a daily average of 20 was attained.

The majority of these structures, now completed—are in service at the "storage front". They are proving most effective and efficient!

CORBETTA CONSTRUCTION COMPANY, INC.

FOUNDED UPON "GETTING THINGS DONE"

EXECUTIVE OFFICE: 220 EAST 42nd STREET, NEW YORK, N. Y.

OKLAHOMA • NEBRASKA • WEST VIRGINIA • PENNSYLVANIA • OHIO • MARYLAND • DELAWARE • NEW JERSEY

MATERIALS AND LABOR PRICES

Market quotations on construction materials and wage rates reported monthly by ENR correspondents

ONLY minor price changes are registered in the ENR construction material and labor rates for February. Southern pine is up $2.00 per thousand board feet in Philadelphia; and 6x12-in. rough pine timber is 50c higher in Dallas.

Crushed slag, ¾-in. size, is 5c. per ton higher in Detroit. Wood paving blocks now range from $1.80 to $2.00 in Chicago, whereas $2.20 was the price that formerly prevailed. Window glass discounts were lowered in Cincinnati. All the other prices were unchanged from their January levels.

Common and skilled construction labor rates remained unchanged from a month ago. The skilled labor average (bricklayers, carpenters and structural ironworkers in the twenty cities reporting to ENR) was $1.606 in February.

The common labor average is $0.832 for the month, an hourly average rate that has remained steady since November.

CEMENT, AGGREGATES, READY-MIXED CONCRETE—F.O.B. CITY

	PORTLAND CEMENT			SAND AND GRAVEL			CRUSHED STONE		CRUSHED SLAG		CONCRETE
	Per bbl., carload lots, including 40c per bbl. for bags, cash discount not deducted			Per ton, carload lots			Per ton, carload lots		Per ton, carload lots, f.o.b. plant		Ready Mixed 1:2:4, 50 c.y. or more, delivered
	Cloth Bags *a*	Paper Bags	Bulk	Gravel, 1½ in.	Gravel, ¾ in.	Sand	1½ in.	¾ in.	1½ in.	¾ in.	
Atlanta	$2.77	$2.52	$2.47	$1.79	$1.89	$1.99	$1.79	$1.89	$1.59	$1.69	$8.00
Baltimore	2.33	2.08	1.88	1.75‡	1.75‡	1.25‡	1.75‡	1.75‡	1.75‡	1.75‡	7.25
Birmingham	2.50	2.25	2.10	1.75	1.75	1.50	.85	1.00	.90	1.15	5.80
Boston	2.75*b*	2.40*b*	2.30	1.40‡	1.40‡	1.00‡	1.40‡	1.40‡	....	....	7.25*m*
Chicago	2.70	2.45	2.30	2.15‡*d*	2.15‡*d*	2.15‡*d*	2.15‡*d*	2.15‡*d*	1.75‡	1.75‡	....
Cincinnati	2.31	2.06	1.81	1.20	1.20	1.10	1.80	1.80	....	....	6.60
Cleveland	2.40	2.15	....	1.70*i*	1.70*i*	1.60*i*	1.70*i*	1.70*i*	1.75*i*	1.75*i*	7.30*i*
Dallas	2.52	2.27	2.07	1.50*p*	1.70*p*	1.10*p*	1.69*p*	1.79*p*	....	....	6.20
Denver	3.08	2.88	2.68	1.20	1.40	1.25	1.65	1.75	....	....	7.25
Detroit	2.40	2.15	2.00	1.40	1.40	1.20	1.63	2.00	2.20‡	2.45‡	6.50
Kansas City	2.58	2.33	2.18	1.85	2.30	1.00	1.91	1.91	....	....	7.50*n*
Los Angeles	2.80*v*	2.20*v*	....	1.30	1.30	1.15	1.30*f*	1.30*f*	....	....	7.25
Minneapolis	2.90	2.65	....	1.00*k*	1.00*k*	.25*k*	1.00*k*	1.00*k*	....	....	7.60*j*
Montreal	....	1.95*rs*	1.79*rs*	....	....	1.30‡*t*	1.20‡*ct*	1.30‡*ct*	....	....	7.90*u*
New Orleans	2.41	2.16	1.96	1.65	1.65	.90	....	....	....	....	9.25
New York	2.66‡	2.41‡	....	1.60*de*	1.60*de*	.90*de*	1.70*de*	1.80*de*	....	....	7.25*k*
Philadelphia	2.31	2.07	1.87	1.55‡	1.65‡	1.20‡	1.90	1.95	1.10	1.10	8.20
Pittsburgh	2.44	2.19	1.99	1.40‡	1.40‡	1.70‡	2.25‡	2.25‡	1.50	1.50	8.25
St. Louis	2.80	2.52	....	1.75‡	1.50‡	1.25/1.50‡	1.10*h*	1.10*h*	.75*g*	.75*g*	8.00
San Francisco	....*w*	2.22	1.92	1.36	1.36	1.36	1.46	1.46	....	....	7.55
Seattle	2.95*o*	2.75*o*	....	1.00*o*	1.00*o*	1.00*o*	2.00*o*	2.00*o*	....	....	7.25

‡ Delivered. *a* 10c. allowed for each returnable bag. *b* 10c. per bbl. off for cash. *c* Plus municipal tax. *d* Per cu. yd. *e* Barge lots alongside docks. *f* Crushed granite. *g* F.o.b. Granite City, Ill. *h* F.o.b. plant. *i* Within three miles of Public Square. *j* 5% discount for cash. *k* Discount of 25c per. c. y. for cash in 10 days. *l* Up to 200 cu. yd. *m* 50c. off for cash *n* 25 c.y. or more *o* 2% off for cash. *p* 10c. per ton off, cash 15 days. *r* 10c. per bbl. off, cash 20 days. *s* 8% sales tax included. *t* 8% sales tax not included. *u.* Price withdrawn. *v* 20c. per bbl. discount; 20c. allowed for returnable cloth bag.

CASH DISCOUNTS CEMENT to Contractors: truck delivery, 2% for cash on 10th of month; on carload deliveries, no trucking, same as dealer cash discount 10c. per bbl. for payment within 15 days of date of invoice. Subject discount 10c. per bbl. 20 days in Montreal.

CURRENT MAXIMUM PRICES RECEIVED AT CEMENT MILL

Charge for bags not included. For cloth bags, add 40c. per bbl.; 10c. refund allowed for each returnable bag; for paper bags add 15c. per bbl., not refundable

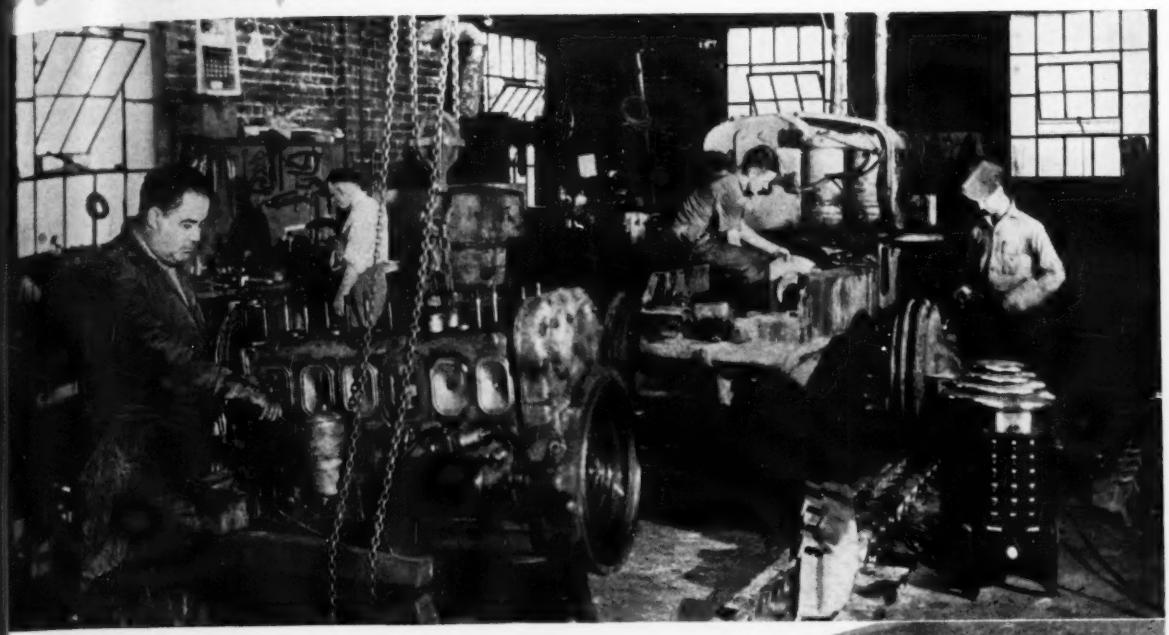
	Bagged	Bulk		Bagged	Bulk		Bagged	Bulk
Buffington, Ind	$1.70	$1.65	Ironton, Ohio	$1.60	$1.55	Richard City, Tenn	$1.80	$1.7
Dallas, Tex. (Inc. 10c. tax)	1.85	1.80	Limedale, Ind	1.70	1.65	Steelton, Minn	1.80	1.7
Hannibal, Mo	1.70	1.65	Norfolk, Va	1.75	1.70	Universal, Pa	1.65	1.6
Hudson, N. Y	1.75	1.70	Northampton, Pa	1.55	1.50	Waco, Tex. (Plus 10c. tax in Tex.)	1.75	1.7
Independence, Kans	1.70	1.65	North Birmingham, Ala	1.70	1.65	Montreal (8% sales tax incl.)	1.68	1.6

PAVING BRICK, BLOCKS, ASPHALT, ROAD OILS—F.O.B. CITY

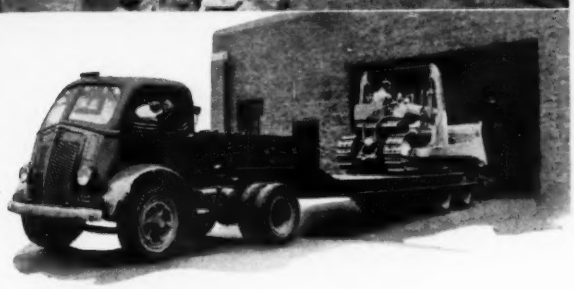
	PAVING BRICKS AND BLOCKS			PAVING ASPHALT		ASPHALT BINDERS—FLUXES		CUTBACK ASPHALT		ROAD OILS	ASPHALT EMULSION (Quick-breaking)	
	Granite per M. lots of 50,000 4x4x8 in.	Brick per M. 3x4x8½ in. carload lots	Wood per sq. yd. 3½ n. 16-lb. treat	Per ton, less than 80 penetration		Per gal., 80-300 penetration		Per ton		Per gal.	Per gal.	
				Tank car	Drums	Tank car	Drums	Tank car	Drums	Tank car	Tank car	Drums
Atlanta	$73.00	$39.35	$2.25	$18.40*e*	$24.62*e*	$0.0787*e*	$0.1309*e*	$0.0876*he*	$0.1348*h*	$0.0676*e*	$0.0826	$0.1384
Baltimore	150.00‡	48.00‡	80.00*m*	15.00	21.00	.06	.09	13.00	23.00	.065	.07	.14
Birmingham	.....	32.00*j*	....	17.95	.....†	.0747	.....†	.0834*h*	.....†	.065	.09	.....†
Boston	85.00	55.00	3.75	14.20	20.00	.06	.09	.065*h*	.115*h*	.065	.09‡	.12‡
Chicago	150.00	55.00	1.80/2.00*d*	14.80	20.80	13.00*g*	18.50*g*	.0625*h*	.15*h*	.05*n*	.08	.12/.14
Cincinnati	112.00	37.50	....	16.40	.....	.085	.....	12.25	.....	.07	.085	.....
Cleveland	118.00	37.50	2.25	19.00	20.00	.09	.105	.10*h*	.15	.08	.085	.09
Dallas	.....	36.00	....	13.25	20.30	.06	.11	16.00	24.80	.06	.05/.07	.07/.09
Denver	.....	27.50	....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Detroit	.....	37.50	....	15.10*f*	22.60*f*	.0725	.1262	15.10	21.10	.067	.0725	.1262
Kansas City	.....	40.00	....	18.50	23.50	.077	.1075	.077*h*	.107*h*	.057	.11	.15
Los Angeles	.....	50.00	....	6.50*b*	15.00	6.50*bg*	15.00*bg*	5.50*b*	.....	.0192	.0525	.1125
Minneapolis	.....	.....	2.30*d*	.....	27.70	.....	.126	.....	32.64	.....	.....	.....
Montreal	.....	.....	....	16.60*k*	24.25*k*	.116*k*	.1485*k*	.115*hk*	.135*hk*	.08*k*	.135*k*	.188*k*
New Orleans	.....	.....	....	13.00*n*	19.00*n*	.055	.085	.06*h*	.09*h*	.....	.078	.....
New York	.....	70.00	....	16.40	23.50*p*	.064	.124*p*	.07*h*	.13*hp*	.0675	.0725*p*	.1225*p*
Philadelphia	130.00	58.00	4.06	14.00	.....	.055	.....	.065*h*	.....	.055	.065	.....
Pittsburgh	135.00	38.75	....	.....	.....	.....	.....	.....	.....	.....	.....	.....
St. Louis	.....	37.00	....	15.00*n*	21.00*n*	14.00*yn*	20.00*yn*	.065*hn*	.11*hn*	.05*n*	.09*n*	.8125*n*†
San Francisco	.....	70.00	....	9.50	18.00	9.50*g*	18.00*g*	10.00	17.50	9.50*g*	.0525	.1125
Seattle	.....	60.00*c*	....	9.50*i*	18.00*i*	.....	19.00*yn*	10.00*i*	.....	9.50*i*	.0575*i*	.0675*i*

‡ Delivered. *a* F.o.b. Baton Rouge. *b* Delivered to purchaser's warehouse. *c* 3½x4x8½ in. *d* 2½ in. 12-lb. treatment. *e* Local reduction due to 20% reduction intra-state class freight rates, only Georgia affected. *f* Mexican. *g* Per ton. *h* Per gallon. *i* F.o.b. Martinez. *j* 3x3½x8½ in. *k* Tax included. *m* Per thousand. † Available on priority only and quoted specially. *n* September 1942 price, none later available. *p* No steel drum shipments except to armed forces.

A New, Faster, Better Service Plan



EQUIPMENT OWNERS FIND IT PAYS TO HAUL 'EM IN FOR REPAIRS...



Here is a new service plan — of far more benefit to equipment owners. Instead of having dealer mechanics travel to the job to make repairs. . . . it's proved to be much better, faster, more economical to haul your outfits to the dealer's shop. Working in comfort, with warm fingers, proper illumination and the right tools, dealer mechanics find they are able to do more justice to a job, and do it quicker. They have the supervision and expert help of the shop foreman — every problem is quickly solved. Parts go farther — worn out or broken sections are fixed up where possible . . . easily, quickly replaced where necessary. Special tools are available to speed the job — clean surroundings assure proper handling of delicate Diesel parts. In addition, the owner's operators who bring in the machines, work with the mechanics . . . thereby help cut the cost of the work and learn plenty about the care and maintenance of the outfits.

The cost of transporting the machines is surprisingly small . . . and usually they are back on the job sooner . . . ready to work longer. Find out for yourself how well you will like this shop plan. Next time your units need repairing . . . haul 'em into your Allis-Chalmers dealer. He's equipped to do your work right, fast and at bigger savings!

HOW THE SHOP PLAN IS WORKING OUT IN ONE TERRITORY!

"It is surprising how much better the customer has been satisfied and how little it costs to transport the tractor to and from our shop. We are turning out more tractors . . . do a better job . . . get better acquainted with the owners and operators," says Walling Tractor & Equipment Co., Allis-Chalmers dealer at Portland, Ore.

WARTIME SERVICE FROM YOUR ALLIS-CHALMERS DEALER

1. **PARTS ASSISTANCE** — Information on availability of parts and how to obtain them.
2. **PRIORITY ASSISTANCE** — Who can get new equipment and how! Up-to-date information on latest regulations.
3. **LIMITATION ORDERS** — Interpretation of latest government limitation orders affecting construction equipment.
4. **SUBCONTRACT INFORMATION**—Frequently dealers possess information on subcontract opportunities.
5. **REBUILDING FACILITIES** — Enlarged, modern shop facilities to handle rebuilding with speed and efficiency.
6. **SERVICE EDUCATION**—Instructions on how to operate and service equipment correctly. Provides service school instructors.
7. **REPAIRS AND MAINTENANCE** — Quick, efficient repairing by skilled, factory-trained mechanics, using the right tools and genuine parts.
8. **USED EQUIPMENT** — In some instances, good rebuilt construction equipment may be available.
9. **RENTALS** — Good used equipment may be available for temporary emergencies.
10. **EQUIPMENT EXCHANGE** — Information center on used equipment available in territory.

ALLIS-CHALMERS
TRACTOR DIVISION • MILWAUKEE, U.S.A.

IRON AND STEEL PRODUCTS—BASE MILL PRICES

	STRUCT. SHAPES-PLATE	REINF. BARS ¼-in. billet *b*	RIVETS ¾-in. structural	WIRE NAILS Base *d*	SHEET PILING Base	STEEL RAILS Per Gross Ton			TRACK SUPPLIES			
						Standard	Light	Re-rolled	Angle Bars	Std. Spikes *c*	Tie Plates *c*	Track Bolts
Birmingham	$2.10	$2.15	$3.75	$2.55	.....	$40.00	$40.00	$39.00	$2.70	$3.00	2.15	$4.75
Chicago	2.10	2.15	3.75	2.55	$2.40	40.00	40.00	39.00	2.70	3.00	2.15	4.75
Pittsburgh	2.10	2.15	3.75	2.55	2.40	40.00	40.00	39.00	2.70	3.00	2.15	4.75
Buffalo	2.10	2.15	.....	.....	2.40	.....	.....	.....	.....	.....	2.15	.....
Cleveland	2.10	2.15	3.75	2.55	.....	.....	.....	.....	.....	.....	.....	.....
Youngstown	.....	2.15	.....	.....	.....	.....	.....	.....	.....	3.00	.....	.....
Detroit	.....	2.27‡	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Gulf ports	2.47*a*	2.52*a*	.....	.....	2.85*a*	.....	.....	.....	.....	.....	.....	.....
Pacific ports	2.75*a*	2.80*a*	.....	.....	2.95*a*	.....	.....	.....	.....	.....	2.30	.....

‡ Delivered. *a* F.o.b. cars dock. *b* Rail steel same as billet prices. *c* Other basing points include Portsmouth, O., Weirton, W. Va., St. Louis, Kansas City, Minnequa, Colo., and Pacific coast ports, on tie plates, alone, Steelton, Pa., on spikes alone, Lebanon, Pa., Richmond, Va. *d* Add switching charge $18 per cl.

IRON AND STEEL PRODUCTS—F.O.B. WAREHOUSE, PER 100 LB., BASE PRICE

	STRUCTURAL SHAPES Per 100 lb. base price	REINFORCING BARS* Per 100 lb., ¼ in., base price				EXPANDED METAL LATH Per 100 sq.yd., carload lots		WELDED FABRIC REINFORCING Per 100 s.f., carload lots			SHEET PILING
		15 tons or over *b* New billet	Rail steel	Add Switch	$/cwt. for Del.	Std. diamond mesh, 3.4 lb.	Std. ribbed 3.4 lb.	4x16 in., No. 5 & 10 wires	4x12 in., No. 8 & 12 wires	6x6 in. No. 6 & 6 wires Per sq. yd.	Per 100 lb. base price
Atlanta	$2.34	$2.39	$2.39	$.02½	$.10	$21.06	$23.00	$1.82	$1.35	$0.1719	$3.04
Baltimore	3.70	2.90	2.75	.....	.10	22.50	24.50	1.70	1.27	.1611	3.00
Birmingham	2.10*a*	2.15	2.15	.02½	.10	19.00	21.00	1.80	1.34	.1701	....
Boston	3.85	3.51	3.36	$20 C.L.	.10	18.50	29.50	1.76	1.31	.1656	2.70
Chicago	2.10*a*	2.15	2.15	.03	.05	21.50	23.50	1.67	1.25	.1575	2.40
Cincinnati	3.68	2.53*cd*	2.53*cd*	.....	.05	19.50	21.50	1.66	1.25	.1566	....
Cleveland	2.10*a*	2.15	2.15	.02½	.10	19.50	21.50	1.66	1.25	.1566	....
Dallas	4.25	3.17	3.17	.....	.....	25.00	27.50	1.93	1.42	.1827	....
Denver	4.35	3.95	3.85	.....	.....	26.50	28.50	1.97	1.45	.1863	....
Detroit	3.65‡	2.52‡	2.52‡	.....	.10	25.00	28.00	1.68	1.26	.1584	2.66
Kansas City	4.00	2.64*cd*	2.64*cd*	.0	.05	19.60	23.60	1.78	1.33	.1683	2.80
Los Angeles	3.65*f*	2.575	2.425	.02½	.05	23.00	27.50	1.93	1.42	.1827	3.65
Minneapolis	3.80‡	2.75	2.75	.0	.10	25.00	27.00	1.80	1.34	.1701	2.75*d*
Montreal	4.00*i*	2.90*i*	2.80*i*	.....	.....	26.00*hij*	33.00*hij*	2.56*i*	3.14*i*	.268*i*	....
New Orleans	4.40	2.52	2.52	.05	.10	21.50	23.50	1.82	1.35	.1715	2.87*5*
New York	3.75	2.76*c*	2.76*c*	.....	.15	17.50	19.50	1.76	1.32	.1665	2.74
Philadelphia	3.65	3.85	....	.....	.....	19.50	21.50	1.71	1.28	.1611	2.74
Pittsburgh	2.10*a*	2.15	2.15	.02½	.10	23.00	26.50	1.59	1.20	.1503	2.40
St. Louis	3.69	2.40	2.40	.0	.05	28.00	34.00	1.69	1.27	.1602	2.70
San Francisco	4.35	2.825	.....	.02½	.10	21.00	24.50	1.93	1.42	.1827	3.85
Seattle	2.75*e*	2.50*e*	.....	.....	.....	34.50	38.50	1.93	1.42	.1827	2.95*d*

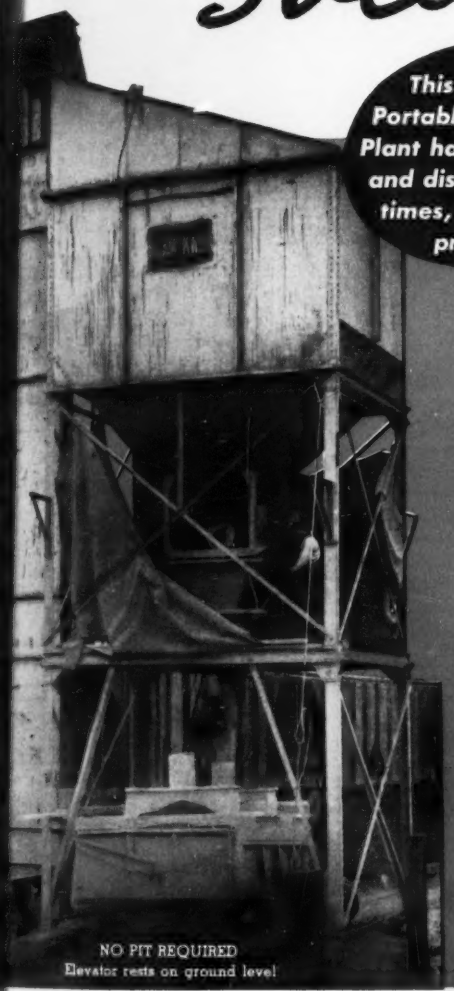
‡ Delivered. *a* Mill prices. *b* 5–15 tons, add 15c. 1–5 tons, add 25c. Less than 1 ton, add 50c. *c* 20 tons or over Base. *d* Mill price plus freight. *e* F.o.b. dock. *f* Includes delivery in free delivery zone. *g* Less than 1 ton, add 25c.; 1 to 5 tons, add 10c. * High scrap steel prices cut former 15c. differences between new billet and rail steel in many mills. *h* List price. *i* Plus Dominion and Province sales tax. *j* August 1942 price; not on market.

PLUMBING, HEATING, WATER, SEWER AND DRAIN PIPE

	C. I. PIPE	VITRIFIED SEWER PIPE				CLAY DRAIN TILE		CONCRETE SEWER PIPE		WROUGHT STEEL PIPE Full standard weight, *k*			
	Per net ton f.o.b. 6 in.	Per foot, std. 8 in.,	delivered std. 12 in.,	ASTM 24 in.,	C13–35 36 in.,	Per 1,000 ft., carload lots, f.o.b.		Per ft., delivered; ASTM	C 14–35	1 to 3 in., Butt Weld		3½ to 6 in.; Lap Weld	
	to 24 in.*a*	s.s.	s.s.			6 in.	8 in.	12 in.	24 in.	Black %	Galv. %	Black %	Galv. %
Atlanta	$49.66	$0.26*b*	$0.468*bc*	$1.8525	$4.68*c*	$85.00	$128.00	$0.45	$1.642	48.2	54.2	59.7	51.2
Baltimore	53.00	.35	.60	2.65	7.25	160.00	200.00	.50	1.75	65.5	57.5	63.0	54.5
Birmingham	45.00	.275	.495	1.95	5.50	100.00	220.00	.50	1.70	62.2	54.2	59.7	51.2
Boston	55.40	.26	.463	2.07	5.85	140.00	.....	.60	....	64.1	56.1	61.6	53.1
Chicago	54.33	.35	.675	2.70	7.00	100.00‡	150.00‡	.45	1.85	66.0	55.0	64.5	53.0
Cincinnati	53.27	.231	.4455	1.80	5.125	105.00	170.00	.60	1.70	57.1	43.4	54.0	39.6
Cleveland	54.75	.224	.432	1.80	5.125	81.00	125.00	.30	1.60	67.8	59.8	65.3	56.8
Dallas	56.43	.31	.58	2.25	5.00	90.00	110.00	.46	1.57	59.9	51.9	57.3	48.3
Denver	61.56	.29†	.52†	2.16†	....	130.00	240.00	....	....	58.4	50.4	55.7	47.2
Detroit	54.75	.245	.4725	1.935	5.14	82.50	131.25	.35	1.50	57.7	44.0	54.8	40.6
Kansas City	55.73	.315	.39	2.20	5.86	140.00	260.00	.45	1.60	35.8	46.3	46.0	59.7
Los Angeles	68.40	.282†	.508†	2.034†	5.085†	115.50	192.50	1.00	2.00	59.6	51.6	57.0	48.6
Minneapolis	59.00	.275†	.495†	1.98†	5.14†	.....	.....	.90	2.10	64.2	53.0	60.5	49.0
Montreal	60.00	.85	1.50	5.25	8.50*e*	45.00*m*	64.00*m*	.48*m*†	1.92*m*†	....	....	....	....
New Orleans	51.78	.26	.48	1.69	.....	150.00	220.00	.40	2.10	62.4	54.4	58.8	50.3
New York	52.40	.385	.7425	2.70	6.65	.....	.....	.60	1.40	64.7	53.7	62.2	50.7
Philadelphia	51.00	.28	.54	2.30	6.75	150.00	225.00	.45	1.75	56.4	42.6	53.3	38.9
Pittsburgh	56.60	.245†	.4725†	1.845†	5.4325	97.80	154.20	.85*g*	2.00*g*	68.5*i*	57.5*i*	66.0*i*	54.5*i*
St. Louis	52.84	.28	.504	2.016	4.50	85.00	220.00	.90*j*	2.00*k*	56.4	42.6	52.5	38.1
San Francisco	68.40	.3625*d*	.6525*d*	2.61	6.52	115.50	192.50	.58	2.34	46.0	32.0	42.0	27.0
Seattle	70.20	.375	.675	2.70	6.75	84.00	187.50	.51*f*	1.44*f*	....	....	....	....

‡ Delivered. † F.o.b. *a* B. & S. class B and heavier, C/L lots, 200 tons and over Burlington, N.J. (base) $49.00. Based on existing freight rates; subject to rate change. Gas pipe and class A, $3 per ton additional, 4 in., $3 per ton additional, 30 in. and larger usually $2 per ton less. *b* Double strength. *c* List to dealer. *d* List. *e* 30-inch. *f* Less 5% for cash. *g* Culvert pipe. *h* Discounts from standard list consumers carload prices, except Pittsburgh prices are f.o.b. mill. Base price $200 per net ton. List prices per ft.: ¼ in., 8½c.; ⅜ in., 11½c.; 1 in., 17c.; 2 in., 37c.; 2½ in., 58½c.; 3 in., 76½c.; 4 in., $1.09; 6 in., $1.92. *i* Applies also at Lorain, Ohio, mills. Chicago delivered base is 2½ points less on butt, 1½ on lap. Freight is figured from Pittsburgh, Lorain, O., Chicago Dist. Billing is from point producing lowest price at destination. WROUGHT IRON PIPE: Base price and list prices per ft. same as wrought steel pipe. Discount for Pittsburgh base: Butt-weld—1 in. and 1¼ in. black 34, galv. 16; 1½ in. black 38, galv. 18½; 2 in. black 37½, galv. 18. Lapweld—2½ in. to 3½ in. black 31½, galv, 14½; 4½ in. to 8 in. black, 32½ galv. 17. *j* Reinforced; spec. C 76–37. *k* Reinforced; spec. C 75–37. *l* Plus sales tax. *m* Tax included.

IN CONSTANT SERVICE SINCE '37
MOVED FIVE TIMES . . . . . AND
still trouble free!



NO PIT REQUIRED
Elevator rests on ground level

This Blaw-Knox Portable Bulk Cement Plant has been erected and dismantled five times, on as many projects

Guy Hamm, Plant Superintendent for Thomas McQueen, Forest Park, Illinois, engineers and contractors, has poured hundreds of thousands of square yards of concrete paving with this bulk cement plant. He says—"In five separate locations we've used this plant with convenience, speed, and maximum dependability!"

Trouble-free because...

CEMENT GATE VALVES are made of machined castings, will not leak or jam.

WEIGHING SCALES are of the precision type. They show when the batcher is full or empty.

BIN SLOPES are steep and smooth for fast flow of the cement.

STURDY CONSTRUCTION permits repeated dismantling and re-erection.

BEST QUALITY conveyors and power drives.

Ask your nearest Blaw-Knox Distributor to tell you about this remarkable Bulk Cement Plant.

BLAW-KNOX DIVISION
of Blaw-Knox Company
2001 FARMERS BANK BUILDING
PITTSBURGH, PA.

NEW YORK CHICAGO PHILADELPHIA
BIRMINGHAM WASHINGTON
REPRESENTATIVES IN PRINCIPAL CITIES

BLAW-KNOX
BULK CEMENT PLANTS

CONCRETE SPREADERS • ROAD FORMS • TRUCK MIXERS • CONCRETE FINISHING MACHINES
CLAMSHELL BUCKETS • BINS AND BATCHERS • CONCRETE BUCKETS • STEEL STREET FORMS
BULK CEMENT PLANTS • CENTRAL MIXING PLANTS • TRUCK TURNTABLES • TAMPING ROLLERS

LUMBER, TIMBER PLYWOOD—PER M FT., B.M., CARLOAD LOTS F.O.B.

	SHORT LEAF YELLOW PINE AND DOUGLAS FIR — All S. L. Y. P. is No. 2 common or better and for No. 1 N. C. Box. (Prices in Bold Face) — *All Fir planks No. 2 common, Fir timber is No. 1 common. Lengths up to 20 ft. (Prices in italics)*								LONG LEAF Y. P. Merchantable grade up to 20 ft.		PLYWOOD (Rail freight increase (See note for base pri
	1x6 S4S	1x8 S4S	2x4 S4S	2x6 S4S	2x8 S4S	2x10 S4S	3x12 Rgh	6x12 Rgh	12x12 Rgh	2x12 Rgh	12x12 Rgh	¼
Atlanta	**$30.00**	**$30.00**	**$29.00**	**$28.00**	**$28.00**	**$31.50**	**$46.00**	.....	.....	$54.00	$62.00	$17.60
Baltimore	**40.00**	**42.00**	**40.00**	**40.00**	**41.00**	**44.00**	**60.00**	.....	.....	110.00	115.00	$21.85
	45.00	*46.00*	*52.00*	*52.00*	*52.00*	*52.00*	*68.00*	*$72.00*	*$72.00*	.....	.....	18.25 22.25
Birmingham	**34.50**	**36.50**	**32.00**	**32.00**	**34.00**	**34.00**	**53.00**	**53.00**	**56.00**	.....	.....	.....
[1]	37.50	37.50	37.00	37.00	37.00	43.00	65.00	.....	.....	67.50	70.00	17.35 21.15
Boston ‡*	**70.00**[2]	**70.00**[2]	**50.00**[2]	**55.00**[2]	**90.00**[1]	**100.00**[1]	**125.00**[1]	.....	.....	125.00	150.00	.....
‡*	*45.00*	*45.00*	*50.00*	*55.00*	*60.00*	*70.00*	*75.00*	*80.00*	*80.00*	.....	.....	18.25 22.25
Chicago	**42.00**	**43.00**	**41.00**	**40.00**	**41.00**	**42.50**	**60.00**	.....	.....	80.00	95.00	.....
	46.00	*46.00*	*47.50*	*47.00*	*47.00*	*48.00*	*67.00*	*66.50*	*68.00*	.....	.....	14.60 17.80
Cincinnati	**41.00**	**42.50**	**39.00**	**40.50**	**42.00**	**43.00**	**53.00**	.....	.....	65.00	68.00	.....
	.....	.....	.....	.....	.....	.....	*55.50*	*55.50*	*55.50*	.....	.....	17.35 21.15
Cleveland	**42.50**	**42.50**	**41.50**	**43.50**	**45.00**	**47.00**	**53.00**	53.00	[55.00	76.00	81.00	.....
Dallas *e*	**39.50**	**40.50**	**39.50**	**38.00**	**38.50**	**39.50**	**53.00**	**53.50**	**53.00**	78.00	83.00	17.75 21.60
Denver ‡	54.00[4]	52.00[4]	55.00[4]	55.00[4]	55.00[4]	56.00[4]	59.00[4]	*73.00*	*79.00*	.....	.....	14.60 17.80
Detroit	**44.00**	**44.00**	**44.00**	**43.50**	**44.00**	**46.00**	**60.00**	.....	.....	53.00	63.00	10.45 12.70
	.....	.....	.....	.....	.....	*51.50*	*55.00*	*60.00*	*60.00*	.....	.....	17.35 21.15
Kansas City	**50.00**	**55.00**	**52.00**	**52.00**	**52.00**	**55.00**	**65.00**	.....	.....	75.00	85.00	.....
	60.00	*65.00*	*52.00*	*52.00*	*52.00*	*65.00*	*65.00*	*80.00*	*80.00*	.....	.....	12.60 15.40
Los Angeles *a*	*55.00*	*55.00*	*53.00*	*53.00*	*51.00*	*51.00*	*67.00*	*65.00*	*56.00*	.....	.....	.....
Minneapolis ‡*b*	**49.00**[3]	**49.00**[3]	.....	.....	.....	.....	.....	.....	.....	.....	.....	9.90*h* 12.05*g*
‡	*53.00*	*53.00*	*53.00*	*52.00*	*52.00*	*53.00*	*59.00*	*61.00*	*61.00*	.....	.....	12.60 15.40
Montreal ††	*45.00*	*46.00*	*42.00*	*45.00*	*47.00*	*54.00*	.....	.....	.....	200.00	200.00	.....
	48.50	*48.50*	*45.25*	*47.25*	*48.25*	*46.75*	*60.75*	*60.75*	*60.75*	.....	.....	.....
New Orleans	**31.50**	**31.50**	**33.75**	**31.75**	**34.00**	**35.00**	**48.00**	.....	.....	69.00	69.00	.....
	31.00	*31.00*	*33.00*	*31.00*	*34.00*	*32.00*	*55.00*	.....	.....	.....	.....	14.60 17.80
New York ‡	**50.00**	**51.00**	**51.00**	**50.00**	**51.00**	**54.00**	**62.00**	.....	.....	120.00*f*	125.00*f*	.....
‡	.....	.....	*65.00i*	*65.00i*	*65.00i*	*65.00i*	[Range from $75 to $95]			.....	.....	18.35 22.25
Philadelphia	**54.00**	**55.00**	**54.00**	**54.00**	**55.00**	**58.00**	**60.00**	.....	.....	88.00	93.00	.....
	54.00	*54.00*	*65.00i*	*65.00i*	*65.00i*	*65.00i*	*67.50*	*$75 to $95*	*$75 to $95*	.....	.....	18.25 22.25
Pittsburgh	**50.80**	**53.20**	**62.75**	**55.00**	**60.85**	**62.50**	**76.25**	.....	.....	.....	.....	.....
	69.20	*68.10*	*66.10*	*65.30*	*65.20*	*65.65*	*88.75*	*88.75*	*88.75*	.....	.....	18.10 22.05
St. Louis ‡*c*	**50.00**	**50.00**	**48.00**	**47.00**	**48.00**	**51.00**	**65.50**	*71.00*	*71.00*	83.00	70.00	.....
San Francisco *d*	*55.50*	*55.50*	*57.00*	*57.00*	*56.50*	*56.50*	*40.50*	*49.50*	*49.50*	.....	.....	14.60 17.80
Seattle	*55.00*	*55.00*	*55.00*	*55.00*	*55.00*	*55.00*	*40.00*	*40.00*	*40.00*	.....	.....	7.30*g* 8.90*g*
										.....	.....	0.00 0.00

[1] **Bold Face type, Southern Pine.** *Italics, Douglas Fir.* [1] Long leaf. [2] Roofers' N. C. Pine. [3] Spruce. [4] Native. [5] Western Pine, No. 3 Common. [7] Spruce. [8] Norway Pine. ‡ Delivered. *a* Yard prices. *b* Contractors discount in Minneapolis and St. Paul discontinued May 21, 1938. *c* 5M ft. or less. *d* F.o.b. cars San Francisco freight rate. *e* 10% discount taken off. *f* Up to 18 ft. † Plus sales tax. * Prices for truck delivery; no longer quoting carload lots f. o. b. city.

NOTE: Special concrete form grade Fir Plywood, 4' by 8' panels, 5-ply, sanded 2 sides, water resistant glue, carload lots, delivered per 1,000 sq. ft. surface Seattle base price on ¾", $86.50; on ¾", $95.30; price includes oiling and seal ing charges. For other centers add rail freight increment from table or prop size. For resin dipped treatment, add $10.50 per M. *g* Lower rate by wat shipment. *h* 50,000 lb. minimum. *i* Ranges from $65 to $69.

GLASS, EXPLOSIVES, CHEMICALS

	WINDOW GLASS — Discounts from jobbers list, Aug. 15, 1938 Single or Double Thickness A quality	B quality	EXPLOSIVES — Per lb. 40% Ammonia Gelatin in 50-lb. cases delivered in 200 lb. lots*
Atlanta	75%	75%	$0.15
Baltimore	78%	79%	.15
Birmingham	76%	76%	.105
Boston	77%	78%	.15
Chicago	77%	77%	.15
Cincinnati	71-10%	71-10%	.15
Cleveland	77-10%	77-10%	.19
Dallas	76%	76%	.1625
Denver	76%	76%	.155*e*
Detroit	77%	77%	.1575
Kansas City	76-10%	76-10%	.155
Los Angeles	86%*d*	88%*d*	.1575
Minneapolis	77%	77%	.155
Montreal	40-5%‡	47%‡	.1675†
New Orleans	70%	75%	.16
New York	81%	82%	.22*f*
Philadelphia	78%	79%	.15
Pittsburgh	79%	79%	.1225
St. Louis	76-10%	76-10%	.155
San Francisco	66-15%	73-15%	.155
Seattle	75%	75%	.1575†

Price of 60% Ammonia Gelatin in $0.01 per lb. higher than 40%

a Disc. from list Sept. 1939. *b* Also less 6% tax exemption. *d* Discount from jobbers' list Sept. 15, 1928. ‡ Plus sales tax.

* Urban prices influenced by service charges or local storage and delivery regulations, do not consistently reflect quantity prices in less congested areas. *e* F.o.b. Louviers, Colo. *f* In boroughs of Kings, Queens and Richmond, and in Manhattan south of Canal Street, add delivery charge of $6.00 per trip † F.o.b.

40% Ammonia Gelatin price ranges in other than urban areas, per lb. (except Seismograph Grades)

	C/L 20,000 lb. net	Tons	200 lb. lots
E. of the Miss., except Fla. and Me	$0.105	$0.13	$0.15
W. of Miss. to Rocky Mtn. States, Fla. and Maine	.11 -.1175	.135 -.1475	.155 -.1675
Rocky Mtn. States	.11 -.1225	.135 -.1525‡	.155 -.1725‡
Pacific N. W. States	.1075-.12	.1375-.15	.1575-.17
Pacific S. W. States	.1050-.1125	.135 -.1425	.155 -.1625

‡ F.o.b. Louviers, Colo., or Butte, Mont.

PILES, TIES—F.O.B.

PILES

Prices per linear foot, pine, with bark on, f.o.b. New York; delivered from barge 1½ to 2c. per ft. additional:

Dimensions	Points	Length	Short Barge	Leaf Rail
12 in. at butt	6 in.	30 to 50 ft.	$0.23	$0.26
12 in.— 2 ft. from butt	6 in.	50 to 59 ft.	.26	.28
12 in.— 2 ft. from butt	6 in.	60 to 69 ft.	.31	.33
14 in.— 2 ft. from butt	6 in.	50 to 69 ft.	.28	.33
14 in.— 2 ft. from butt	6 in.	70 to 79 ft.	.31	.37
14 in.— 2 ft. from butt	5 in.	80 to 85 ft.	.40	.48
14 in.— 2 ft. from butt	5 in.	85 to 89 ft.	.45	.53

RAILWAY TIES

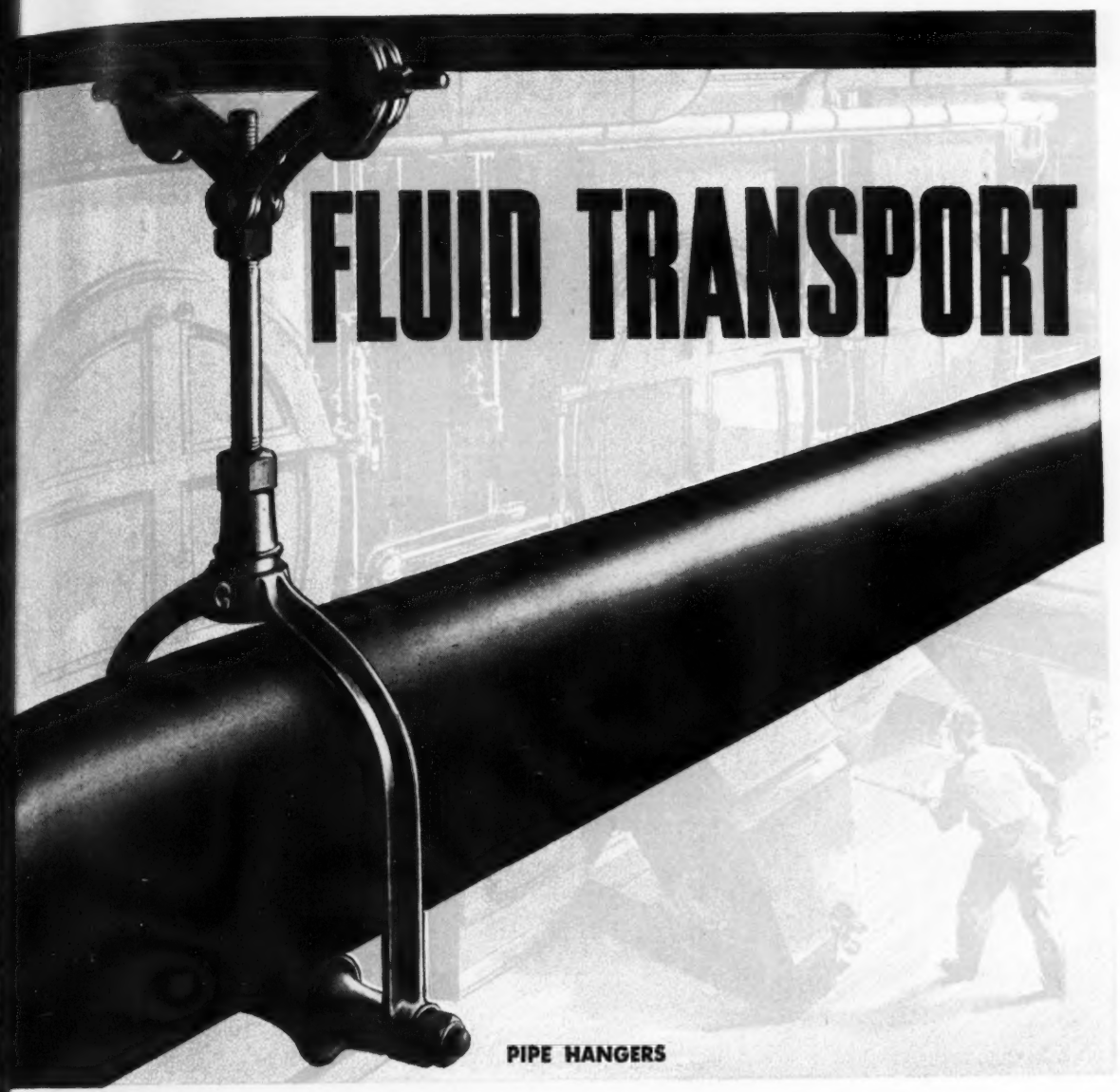
Prices f.o.b., per tie for carload lots:		6"x8"x8' Untr.	Tr.	7"x9"x8'6" Untr.	Tr.
Boston	Oak	$1.50	....	$2.00	....
	Pine	2.00	$3.00*a*	3.00	$3.50*a*
New York	S. L. Sap Pine	1.43/1.54	2.59	1.76	2.86
	Mixed Oak	1.71	2.59	2.42	3.58
Birmingham	White Oak	1.00	1.60*a*	1.30	2.25*a*
	Southern Pine	....	....	....	....
Chicago	Red Oak	....	2.40*a*	....	3.00*a*
	Southern Pine	....	....	....	....
Los Angeles	Douglas Fir	1.10	1.75*a*	1.60	2.50*a*
Philadelphia	Red Oak	....	2.10*ag*	....	3.25*ag*
St. Louis	White Oak	1.65*	....	1.90*	....
	Red Oak	1.55*	2.15*a**	1.90*	2.70*a**
	Sap Pine or Cypress	1.35*	....	1.70*	....
San Francisco	Douglas Fir	1.15*ef*	....	....	3.00*ef*
Montreal	Birch or Maple	.85	.95	....†	....†

Tr.— Treated; Untr.— Untreated. *a* Creosoted. *b* 6" x 8 x 8'6". *c* Empty cell. *d* Zinc. *e* Green. *f* F. o. b. cars. † Out of market. * September 1942 price, none later available. *g* January price, none later available.

CHEMICALS

Water, sewage treatment road work, f.o.b. carlots, New York

Bleaching powder, in drums, f.o.b. works, per 100-lb	$2.25- 3.10
Chlorine cylinders, liquid, per lb. delivered	.0525
Calcium chloride, 77-80%, flaked, in 100-lb. paper bags, delivered, per ton	18.50-35.00
Silicate of soda, 52 deg., in drums, f.o.b. works, per 100 lb	1.40
Soda ash, 58%, in paper bags, per 100 lb. dense	1.15
Sulphate of aluminum, commercial, in 100-lb. bags, per ton	23.00-25.00
Sulphate of copper, in bbl., per 100-lb	5.15- 5.55



"THE NORTH WING HAS STOPPED 'SQUAWKING'." It takes more than pipe alone to distribute steam for power, processing and heat to all the spots in a plant where steam is essential. It calls for experienced piping engineering to compensate for such factors as weight, pressures, exposures, expansion and contraction.

The distribution of steam is a job for Grinnell FLUID TRANSPORT. As fabricators and manufacturers Grinnell supplies the connecting links which convert a pile of pipe into a complete piping system.

For new war construction, or maintenance and repair of existing piping, call your nearby Grinnell branch. Grinnell Company, Inc., Executive Offices, Providence, R. I. Plants and offices throughout the U. S. and Canada.

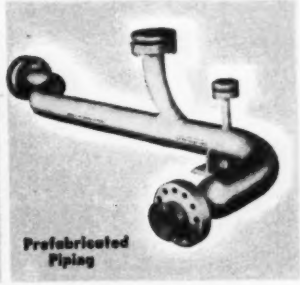
GRINNELL

WHENEVER **PIPING** IS INVOLVED

Automatic Sprinkler Systems

Gonspring Constant-Support Pipe Hangers

Pipe and Tube Fittings


Prefabricated Piping

STRUCTURAL CLAY BUILDING TILE, BRICK AND LIME—DELIVERED

	STRUCTURAL CLAY TILE — PARTITION — SCORED Per M. lots of 2,000 pieces or over, 3x12x12 in.	4x12x12 in.	8x12x12 in.	STRUCTURAL CLAY TILE — LOAD BEARING — SCORED Per M. lots of 2,000 pieces or over, 8x12x12 in.	10x12x12 in.	12x12x12 in.	BRICK Per M. in quantity. Common backing	Straight hard	LIME Per ton, Hydrated finishing	In paper, Common hydrated	Carload Pulverized or lump
Atlanta	$104.00	$114.00	$199.00	$234.00	$244.00	$250.00	$13.50	$18.04	$26.54	$15.04	$15.04
Baltimore	84.00	90.00	170.00	200.00	260.00	320.00	15.00*k*	19.00*k*	18.00	13.00	2.80*m*
Birmingham	80.00	85.00	160.00	191.00	252.00	288.00	14.50	17.00	18.11	13.04	2.25*n*
Boston	89.35*a*	93.30*a*	178.70*a*	202.50	271.80	308.20	16.50*i*	19.50*i*	17.50*t*	12.50*t*	14.32*r*
Chicago	72.00	77.00	145.00	197.00	243.00	278.00	12.50	13.50	17.00	15.00	12.50
Cincinnati	65.55	69.90	131.20	148.70	210.35	240.45	17.50	17.50	15.50	13.00	.....
Cleveland	60.00	64.00	120.00	144.00	193.00	221.00	17.00	17.00	15.75*j*	13.25*j*	3.00*m*
Dallas	62.50	67.50	135.00	162.00	212.50	263.00	13.50*i*	15.00*i*	19.00	15.00	.95*n*
Denver	84.80	95.40	153.70	178.20	212.00	227.90	14.50	17.00	25.00*j*	17.00*j*	20.00*r*
Detroit	86.05	91.80	172.10	213.00	268.00	330.00*e*	17.50	18.00	18.00	16.00	16.00
Kansas City	67.00	69.00	89.00*c*	128.00	163.00	189.00	15.00	16.00	19.32	13.00	10.92
Los Angeles	73.50†*r*	89.50†*r*	128.00†*r*	210.00†*r*	368.00†*r*	460.00†*r*	13.50	15.00	16.50	17.50	17.50
Minneapolis	81.00*b*	86.40*b*	146.90*b*	.....	177.00*b*	246.00*b*	13.60	15.60*g*	21.00	16.00	19.00
Montreal	99.10*a*	105.65*a*	154.75*a*	104.65*au*	154.75*au*	155.25	22.00†*u*	27.25†*u*	24.60*u*	18.00*u*	.....
New Orleans	72.00	72.00	135.00	162.00	210.00	260.00	14.00	.....	18.30	12.08	14.10
New York	78.40	83.60	115.00*c*	193.30*h*	238.80*h*	295.60*h*	15.00	.....	20.00	14.00	17.00
Philadelphia	90.00	97.70	183.20	197.10	243.20	301.10	17.00	20.00	15.50	8.55	10.55
Pittsburgh	62.35	66.55	124.75	140.25	173.25	198.00	17.50	19.50	17.90	15.40	2.55*m*
St. Louis	67.00	95.00	130.00	190.00	244.00	290.00	18.00	17.00	22.00	18.00	24.00
San Francisco	84.00	94.50	225.00	.....	.....	.....	17.50	22.00	20.00	20.00	16.40
Seattle	115.00	125.00	230.00	.....	.....	.....	20.00*f*	21.00*f*	20.00*s*	20.00*s*	20.00*s*

† F.o.b. *a* Smooth. *b* Carload lots delivered to job. *c* 6x12x12 in. *d* Not load bearing. *e* 48 lb. tile. *f* Less $1.00, ½ cash 15 days, balance 30 days. *g* Selected common. *h* F.o.b. Perth Amboy, N. J. *i* F.o.b. Warehouse only. *j* LCL. *k* $1.00 discount if paid in 10 days. *l* Lump. *m* Per bbl., 180 lb. sack 100 lb. *n* Per bbl., 200 lb. *o* Per bbl., 280 lb. bag. *r* 5% discount 10 days. *s* 2% discount for cash. *t* 5½x8x12. *u* 8% sales tax included

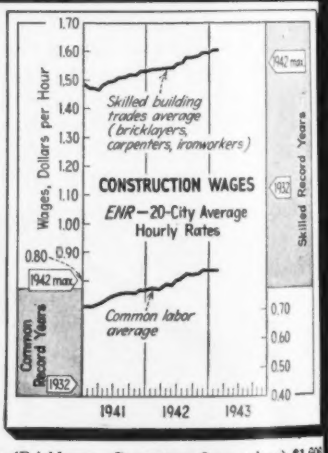
PAINT, ROOFING—F.O.B. CARLOAD LOTS

	RED LEAD Per 100 lb. in. 600-lb. (Approx.) bbl. Dry *a*	WHITE LEAD Per 100 lb. in oil	READY-MIXED PAINT Per gal., drums Graphite *b*	Aluminum *b*	Ferric Oxide *d*	ROOFING SUPPLIES Carload lots f.o.b. factory Rolls, slate surfaced, 85–90 lb. per sq.	Asphalt felt, per 100 lb.	Tar felt, per 100 lb.	Asphalt coating per gal	Tar pitch 350 lb. bbl. per ton
Atlanta	$10.25	$14.125	$1.30	$2.25	$1.20	$1.90	$1.61	$1.61	$0.27	$29.00
Baltimore	10.00	13.75	2.00	3.00	2.50	2.30	2.70	2.70	.40	29.00
Birmingham	10.25	14.125	2.35	3.50*r*	1.98*r*	2.04	1.97	1.97	.32	28.35
Boston	10.00	13.75	1.60	....	2.40	2.12‡	1.72*h*‡	1.72*h*‡	.50‡	20.00‡
Chicago	10.00	13.75	....	....	....	1.75*h*/	1.74*h*/	1.82*h*/	.33/	23.00/
Cincinnati	10.00	13.75	1.70	2.90	1.60	2.40	2.39*h*	2.39*h*	.36	21.00
Cleveland	10.00	13.75	2.10	4.80	1.95	1.93	1.83*h*	1.83*h*	.35	29.00
Dallas	10.00	14.50	1.88	2.11*n*	.05*l*	1.75*h*	1.66*h*	1.66*h*	.35	39.00
Denver	10.50	14.25	1.65	....	.27*l*	2.45	3.15	3.15	.35	28.00
Detroit	10.00	13.75	1.75	3.00	1.60	2.10	2.06	2.06	.35	23.00
Kansas City	10.00	13.875	2.39*g*	2.55*gr*	2.16*gn*	2.10	2.30	2.30	.28	27.5
Los Angeles	10.25	14.25	1.60	2.25	2.30	2.10	1.50	....	.45	.....
Minneapolis	10.00	13.875	....	....	....	1.75*i*	1.66*h*‡	1.66*h*‡	.32	23.00
Montreal	9.25	6.25	2.85*p*	5.39*p*	2.70*p*	2.85	2.58	2.07	.63	1.85*k*
New York	10.00	13.75	2.03	....*r*	1.64	1.66	1.58*h*	1.58*h*	.26	25.00
Philadelphia	10.00	13.75	....	....	....	1.75	1.66	1.66	.32	23.00
Pittsburgh	10.00	13.75	1.05	1.95	.80	1.95	1.94*h*	1.94*h*	.34	26.00
St. Louis	10.00	13.75	2.28*s*	2.89*s*	1.96*s*	1.91	1.66	1.66	.28	22.00
San Francisco	10.25	14.00	1.80	2.75*n*	1.35/2.35	1.71	2.40	2.40	.33	19.50
Seattle	10.25	14.25	1.90	3.00	....	2.15	2.16*h*	....	.35	26.50*j*

‡ Delivered. Note: Red lead in oil 50c. higher than white lead in oil. *a* Red lead prices change frequently due to pig lead price changes. *b* U. S. War Dept. Spec. 3–49A. *c* ASTM Spec. D266–31. *d* 80% minimum ferric oxide. *e* Subject to 25% discount. *f* Distributors' price to contractors. *g* 5 gal. can. *h* Per roll, 65 lb. *i* Minneapolis and vicinity. *j* Asphalt pitch. *k* Per 100 lb. *l* Per lb. *m* Per bbl. *n* May, 1941 price, no later quotation available. *p* Plus 8% sales tax. *r* Not available, except on priority rating; then quoted specially. *s* December price.

SKILLED AND COMMON WAGE RATES—PER HOUR

	Bricklayers	Carpenters	Struct. Iron Workers	Hoisting Engineers	Plasterers	Common Labor Building	Common Labor Heavy Const.
Atlanta	$1.50	$1.25	$1.375	$1.00/1.25	$1.50	$0.40	$0.50
Baltimore	1.75	1.375	1.80	1.625/1.80	1.50	.70	.70
Birmingham	1.75	1.125/1.25	1.50	1.25/1.50	1.50	.65	.65
Boston	1.625	1.50	1.65	1.875	1.667	.80/1.00	.80/1.00
Chicago	1.75	1.70	1.76	1.75	1.825	1.10	1.10
Cincinnati	1.75	1.50	1.625	1.40/1.55	1.625	.80	.80
Cleveland	1.75	1.55	1.75	1.75	1.75	1.00	1.00
Dallas	1.625	1.25	1.50	1.75	1.625	.60	.75/1.25
Denver	1.65*b*	1.50*b*	1.625*b*	1.43*b*	1.51*b*	.80*b*	.80*b*
Detroit	1.675	1.50	1.75	1.625/1.75	1.675	.90	.90
Kansas City	1.65	1.50	1.625	1.625	1.65	.90	.55
Los Angeles	1.50	1.50	1.50	1.50	1.667	.75	.75
Minneapolis	1.50	1.375	1.50	1.40	1.50*e*	.925	.925
New Orleans	1.50	1.25	1.50	1.50	1.375	.65	.65
New York	2.00*b*	1.85*b**	2.00	2.00*b*	2.00*b*	1.031	.95
Philadelphia	1.90	1.50	1.90	2.00	2.00	.825	.825
Pittsburgh	1.90	1.50	1.75	1.625	1.75	.80	.70
St. Louis	1.75	1.50	1.75	2.00	1.75	.95	.95
San Francisco	1.75	1.4375	1.75	1.50	1.75	.95	.95
Seattle	1.715	1.415	1.615	1.565	1.715	1.015	1.10
Montreal	.965	.855	.90	.80	.945	.505	.505



b 7 hr. day. *d* 35 hr. wk. *e* 30 hr. wk. *Negotiating now for increased rate.

ENR Skilled Average: (Bricklayers, Carpenters, Ironworkers) $1.606
ENR Common Average: $0.832

the

KNOW man

TESTING in

your plant

☐ *Bulletin 161*—Southwark-Tate-Emery Testing Machines

☐ *Bulletin 162*—Stress-Strain Recording

☐ *Bulletin 164*—SR-4 Strain Gage

☐ *Bulletin 165*—SR-4 Torquemeter

☐ *Bulletin 169*—SR-4 Portable Strain Indicator

☐ *Bulletin 170*—SR-4 Strain Recorder

☐ *Bulletin 153*—Strain Gages and Extensometers

☐ *Bulletin 166*—Porter-Lipp Strain Gage

☐ *Bulletin 167*—Whittemore Strain Gage

☐ *Bulletin 134*—R. R. Moore Fatigue Testing Machine

☐ *Bulletin 109*—Norton Damping Capacity Testing Machine

☐ *Bulletin 154*—Carpenter Torsion Impact Testing Machine

...this literature will give you the facts!

Today plants are required to work with materials which they have never used before. In some cases, entirely new production facilities are being installed. Production men are faced with unfamiliar specifications. Production must be fast, and finished equipment has to be right. Time is not available for experimentation.

Are you faced with a situation like this? If you are, and if the matter of *testing* routines and the specific testing equipment to do the job are problems, you can take the first step toward solving them by sending for this helpful Baldwin Southwark literature.

Already in widespread use throughout the country, Baldwin Southwark testing machines and instruments are simple to operate, versatile in application, and offer unsurpassed sensitivity and accuracy. There is Baldwin Southwark testing equipment for your specific job of testing. Know about it now. Write for this literature today.

BLW THE BALDWIN GROUP **BALDWIN SOUTHWARK**

Division THE BALDWIN LOCOMOTIVE WORKS, Philadelphia, Pa.

Mall 1½ H.P. GASOLINE POWER UNIT

8 Interchangeable Tools Make Unit Easy To Keep Busy

★ **VIBRATING — places low-water-cement-ratio concrete better and faster. It eliminates honeycombs and voids and expensive hand patching. It assures a better bond with reinforcement and permits an earlier stripping of forms**

★ **WET RUBBING—one man can put a finer finish on 5 times the area possible with hand methods**

★ **SANDING—saves time cleaning and feather edging form boards right on the job**

★ **PUMPING — excavations — 1500 g.p.h. at 10 ft. head**

★ **SAWING—squaring form boards to size and salvaging waste pieces for bracers, etc., with circular saw**

★ **DRILLING—in wood, steel, brick and concrete**

★ **ALSO WIRE BRUSHING and SHARPENING TOOLS**

Air cooled gasoline engine delivers variable speeds from 1000 to 3700 r.p.m. and uses very little fuel.

Available for Victory Construction—full details upon request.

MALL TOOL COMPANY
7730 SOUTH CHICAGO AVE.
CHICAGO, • ILLINOIS

New Surfacing Technique

A surfacing technique developed by the Irving Subway Grating Co., is said by the manufacturer to be a means of improving ordinary dirt roads into modern high speed highways. The new technique consists of laying steel grating mats, each 2 ft. by 12½ ft., and filling the meshes with sand. These gratings are

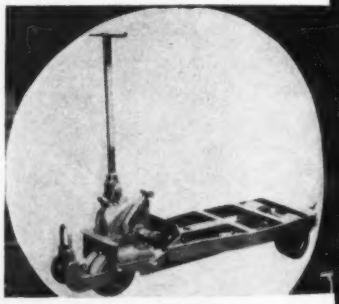
similar to the portable emergency landing mats being manufactured by the company for the air forces. The steel mats consist of alternate straight and crimped bars with fastening means around all edges. Only binder necessary to keep the sand confined in the mesh is oil sprinkled on the surface. Walter E. Irving, founder and president of the company, estimates that a mile of surfacing, 25 ft. wide, may be laid in 12 hours under normal conditions.—*Irving Subway Grating Co., 152 West 42nd St., New York, N. Y.*

Variable Gage Motor Cars

New motor cars, the first variable gage cars to be used for military operations, have been designed especially for the Corps of Engineers, Railway Operating Service for operation with the United States Armed Forces. These cars are said to be suitable for use on a wide range of track gages from 30 in. narrow gage to 66 in. Russian gage. They are supplied in three models, light inspection motor car; heavy duty section 8-11 man tow car; and heavy trailer car. These new cars embody all the carefully designed features of the many standard lines of Buda cars, plus many technical engineering advances made in developing t
Wheels, bearings and axles are standa
ized and interchangeable on all mo
of variable gage cars.—*The Buda
Harvey, Ill.*

Trailer Type Hand Lift Truc

As a remedy for the urgent need
new, more efficient methods of m
movement of materials, the Yale & To
Mfg. Co. has designed and develo
the new Yale Load King Trailer T
hand lift truck. Fitted with safety s
coupler attachments front and rear,
Load King is said to be the ideal l
carrying unit for trailer train operati
—a method by which materials can
quickly dispatched over greater pl
areas in the shortest possible time. Wh
not operating as a trailer, the Load K
functions as a conventional type ha
lift truck. It embodies in its constr
tion all those features for which Y
hand lift trucks are well known. It
said to reduce by over 50 percent
penses incurred when buying conv
tional trailer equipment, and fits in w
equipment already in use. The sa



self-coupler attachments with which
Load King trailer type hand lift truc
are equipped simplify the method
connecting or disconnecting train for
tions. The operator merely pushes tru
together, and a front end coupler k
slides through jaw ends of the ot
truck coupler, pushing up the latch t
automatically drops into locked positi
and the train is formed. To break tra
the operator merely steps on the pe
pad of the latch casting, and the trail
are disconnected.—*The Yale & To*

—Official U. S. Navy Photograph

★ In fulfilling its destiny, steel wire rope is now called upon to withstand the wear, tear, stress and strain of war time production. Its fields of service are the "hot spots" of industry. Shipyards, oil fields, mines, mills, steel plants, construction jobs . . . are a few of its important battle stations.

While wire rope is designed for hard work, its actual life span is definitely influenced by the way in which it is handled, as well as by the condition of the equipment on which it is used. Kinks, reverse bends, corrugated sheaves, improper fleet angle, incorrect or insufficient lubrication—are some of the adverse factors that are often encountered.

As so much steel is required to provide the sinews of war, it is obvious that the more hours of work that can be had from every pound of wire rope used, the more steel—and time—will be saved. Let us make every saving possible of these two vital items, so that our fighting forces will have plenty to fight with, *and when needed.*

For further information on the proper use, care and application of wire rope, as well as regarding any wire rope problem that you have . . . feel free to consult our Engineering Department.

A. LESCHEN & SONS ROPE CO.

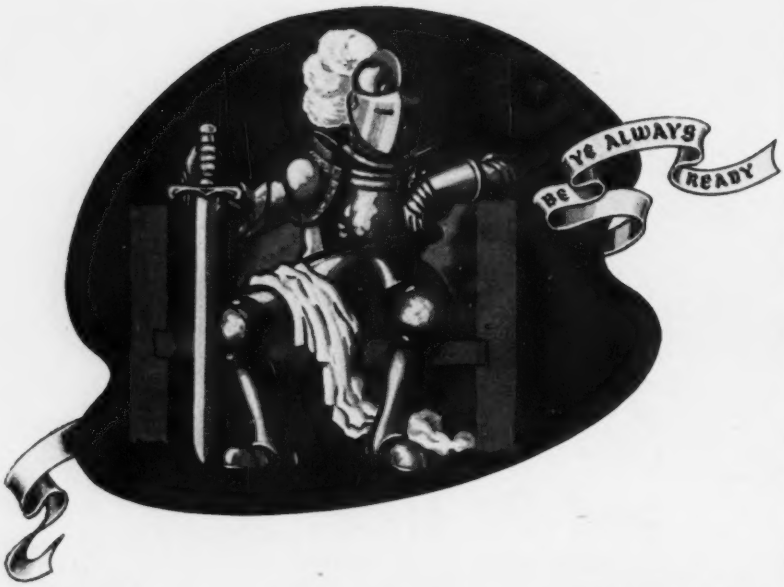
WIRE ROPE MAKERS — ESTABLISHED 1857

5909 KENNERLY AVENUE — ST. LOUIS, MISSOURI, U. S. A

NEW YORK . . . 90 West Street
CHICAGO . . 810 W. Washington Blvd.
DENVER . . . 1554 Wazee Street

HERCULES RED STRAND WIRE ROPE

SAN FRANCISCO . . 520 Fourth Street
PORTLAND . . 914 N. W. 14th Avenue
SEATTLE . . 3410 First Avenue South



REAL PROTECTION

In the olden days a knight in armor was the only protection the less fortunate had against those who would plunder and destroy. They practiced eternal vigilance and lived their motto—"Be Ye Always Ready."

Today, far-sighted municipalities rely upon the dependable Mueller-Columbian Fire Hydrant to protect them from the ravages of fire. For, like the knight of old, here is a sturdy servant that silently stands guard twenty-four hours a day, "always ready" to swing into action when needed—and without failures!

And here is why. The self-oiling top keeps all working parts immersed in a bath of oil. No parts ever rust, the hydrant cannot stick, and the bonnet is always dry. It opens instantly—to protect you—anytime! . . . The main valve is of superior design to deliver large volumes of water in a minimum of time without water hammer. There is no trick mechanism to get out of order. Large dual bronze-bushed drain valves positively keep the barrel dry when not in use. Cannot freeze—ever! . . . Should the hydrant be struck a smashing impact, the damage is confined to a safety flange and coupling which can be replaced at a cost of but a few dollars, and the hydrant can be back in service protecting your city in less than an hour.

For certain protection and actual savings in money to your community, specify MUELLER-COLUMBIAN Fire Hydrants for every new hydrant or replacement.

. . . . For further information, write Dept. W-5.

MUELLER CO.

CHATTANOOGA, TENN.

Mfg. Co., Philadelphia, Pa.

Testing Machine

A 1,000,000 pound testing mac built by the Southwark Division o Baldwin Locomotive Works, has installed in the new Northwestern versity Technological Institute, at E ton, Ill. This machine is one of a g of scientific devices built for the in tion to further effectiveness of

ments of war and to be used to dev higher living standards with the re to peace. This huge machine stands stories high and can handle members to 18 ft. high for tests in either ten or compression. It is capable of ap ing transverse loads up to 1,000 pounds on girders or rigid frames u 55 ft. wide and 18 ft. high. Distrib or torsional loads can also be applie means of a series of hydraulic jacks connections to the massive concrete f dation girders.—*The Baldwin Locomo Works, Baldwin - Southwark Divi Philadelphia, Pa.*

Tractor Grip-Lug

The Bulldog tractor grip-lug, w applied to worn tractor grousers, is not only to reduce expensive repl ment costs, but to save time and labor greatly increasing traction. The g lugs are easily welded to worn grous They are made to fit any Caterp type tractor, are grooved and bevele both sides to facilitate laying a wel bead along the edge. Additional stren is added to the grip-lug because of specially designed shape, the wel metal forming and holding like a vis and around the grooves and bevel *Allied Steel Products, Inc., Clevel Ohio.*

Flash Welder

The first of a series of standard flash welders has been announced Progressive Welder Co., to further pand that company's line of prod

OUR SALVATION INTERNATIONAL SERVICE IN 1943!

w International TracTracTors, Wheel Tractors, and Power Units will not be available for civilian use 943 except in very limited quantities. The Armed es are getting most of them.

t of this you can be sure: the International Indus- Power dealer will render you International Serv- the very limit of his ability. His service facilities, h you learned to depend on in peacetime, have enlarged, improved, and broadened to meet war- needs. His shop is busier and better equipped than His mechanics and servicemen are meeting—and ng—new problems of overhaul, reconditioning, repair and doing a bang-up job of it. His stocks Genuine IHC Parts are in A-1 shape.

And yet, Service as the International Industrial Power dealer thinks of it, means more than repairing tractors and equipment and supplying you with the repair parts you want when you want them. He's a sound, practical consultant on your equipment and construction problems. He knows machinery and its application to your specific jobs. He knows many a short cut in getting jobs done. He can help you get maximum output from your equipment in this critical time.

More work and longer life from every machine is what both of you are shooting for in 1943. Keep in close touch with him and work out your problems together.

INTERNATIONAL HARVESTER COMPANY
180 North Michigan Avenue Chicago, Illinois

NTERNATIONAL Industrial Power

WE'VE MADE BILLIONS -and not one has loosened

THEY'RE on oil well pumps—some for twelve years.

They're standard equipment on rock drills—industry's toughest fastening problem.

They're on tanks, planes, guns—all kinds of wartime material—all kinds of peacetime equipment.

All told, billions of Elastic Stop Nuts have gone to work.

And as far as we know, not one has failed to do its job.

That job is to hold fast and stay put—come what may in the way of vibration, jar or chatter.

Of course the need for such dependable fastenings in war goods and planes is paramount. Some planes take as many as 35,000 in a single ship.

So even at our 4,000,000-a-day rate (which soon will double) the demand keeps growing.

But this constant call for more and more—to meet the exacting responsibilities of war—gives ample proof that Elastic Stop Nuts answer every need for secure locking and speedy fabrication.

ELASTIC STOP NUT

CORPORATION OF AMERICA

2330 Vauxhall Road, Union, N. J.

WITH THE RED COLLAR — SYMBOL OF SECURITY

FASTER • BETTER • STRONGER

HYDRO-TITE FOR BELL & SPIGOT PIPE JOINTING

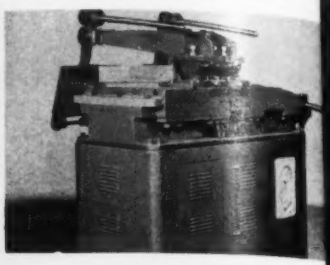
Hydro-Tite is a dependable self-caulking sulphur-base compound for jointing water mains and soil pipe—costing less than lead —requiring no skill to make tight joints. Same crew can lay more pipe per day. Stands deflection and vibration. In use 30 years without failure.

Write for Jointing Book.

HYDRAULIC DEVELOPMENT CORP.

50 CHURCH STREET — NEW YORK, N. Y.

now including all forms of resistance welding equipment from guns and fixtures to seam, projection, rocker and pedestal type welders. Outstanding features of the new standard Model [illegible] flashwelder, rated at 150 kva., is the incorporation of a "Flash-trol" monitor which provides an automatic weld-quality control by eliminating short circuiting of the flash welding arc. The device makes possible a higher than normal rate of acceleration of the feed-platen while performing the weld, thus insuring that the maximum rate of weld completion is automatically employed, without the danger of incomplete welds or line overloads due to short circuiting.—*Progressive Welder Co., Detroit, Mich.*



Holding Insulation in Place

The Insulator Supply Co. has announced the development of "Batsys," fireproof, rot proof, self-adjusting rods to hold insulating wool in place in homes and other buildings. As shown in the accompanying illustration, the "Batsys" are simply bars of gypsum, attached to framing to hold the wool in place. They can be adjusted to 16 or 24 in. centers or variables thereof.—*Insulators Supply Co., Stanton Ave., Cincinnati, Ohio.*

Lift Truck Attachment

Manufacturers seeking ways to speed the handling of motors, casting production machinery of other loads ordinarily handled on crane hooks will find an economical, flexible solution in the crane

When Today's Visions Take Shape

NO MAN can say what tomorrow's world will be like, but this much seems assured: There will be new forms, new methods and new economies of building that will have a far-reaching effect on the way of life in this country.

Today, Stran-Steel is doing things with steel that enlarge its scope and create new fields of usefulness. Traditional limitations of design have been overthrown, old practices revised, and a vast fund of engineering knowledge acquired as a reservoir for peacetime problems. Stran-Steel is a progressive organization, well qualified to serve the men whose visions will shape the future.

STRAN STEEL

DIVISION OF GREAT LAKES STEEL CORPORATION
1130 PENOBSCOT BUILDING, DETROIT, MICHIGAN

UNIT OF NATIONAL STEEL CORPORATION

When a Hut is Home

IT HAS TO BE LIVABLE!

Home in the army may be where you toss your barracks' bag, but it means a lot to morale if that place is warm and dry and light and snug . . . and the Victory Hut is all of those, and more!

In this war, our military leaders know the value of morale . . . that's why the Victory Hut is made to answer their specifications. For example:

Because of its Air-Space insulated construction, it's cool in hot climate and warm in cold. • Because it's light in daylight, and built to reflect electric lights at night, it saves eyesight, permits reading, writing or sewing at all allowed hours. • Because it's built to be erected quickly by men who may never even have put up any kind of housing, Victory Huts literally spring up in a few hours actual over-all time, — and if the crew is experienced, in as little as six man-hours.

And — because it is mass produced to a standardized design, the Victory Hut saves our government $30 to $50 per man housed.

Above all — Victory Huts have been delivered in a matter of days after being ordered. They are ready when needed — *now!*

TEXAS PRE-FABRICATED HOUSE AND TENT CO.

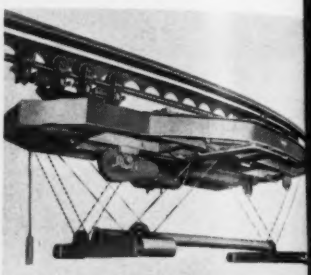
Dallas, Texas

MAKERS OF "VICTORY" HUTS AND "VICTORY" HOMES
TRADE MARK TRADE MARK

arm equipped Towmotors develope the Towmotor Co. Extreme versatil moving all types of materials on sta forks is claimed for the lift truck b manufacturer.—*Towmotor Co., Cleve Ohio.*

Tramrail Carrier

The Cleveland Tramrail Divisio the Cleveland Crane & Engineering has announced a new stabilized tra carrier that is said to solve one of oldest problems in hoisting—that of pending a load rigidly with the us the usual flexible hoisting ropes. simple patented arrangement of ropes to form a triangular suspensi load can be held rigidly in place so



eliminate longitudinal, lateral and tational sway. The rope angles ha definite relation to one another and been worked out according to a m matical formula. A load can be r or lowered through a considerable tance and yet with nothing more the hoisting ropes supporting it, wil main as rigid as if guided in an ele shaft. Further, even if the load sh be considerably unbalanced, the ca will hold it rigidly in place, the m facturer says. Another desirable vantage is the feature permitting the ing of a load in either direction relation to the rail on which the ca is propelled.—*Cleveland Crane & E neering Co., Wickliffe, Ohio.*

Preparing Surfaces

Metallizing Engineering Co. has nounced a new fuse-bond process, equipment for its application whe machine components and similar m parts may be prepared for metalli electrically. Main advantage of the p ess is that it affords an adequate b on the hardest surfaces. It also sim fies preparation of narrow edges, areas, and cylindrical parts having ways, and other interruptions in surfaces. Application of the proces made with the Metco fuse-bond Operating on any 110 or 220 volt, s phase power line, this equipment fus rough deposit of electrode metal int surface to be metallized. Electrodes applied to the work with a special h

All Kinds of Saboteurs Can't Be Stopped At the Gates

Fences and guards won't keep out accidents — as much to be guarded against as enemy agents

IN terms of crippling damage, on-the-job accidents are just as sinister as the human saboteur. Whenever precautions against them are relaxed, they are likely to strike suddenly and viciously, injuring and killing men, damaging equipment, wasting irreplaceable material, upsetting schedules.

To you, as a contractor faced with fast schedules and lack of trained manpower, the prevention of sabotage caused by accidents has become a "must". To help you achieve it most surely, American Mutual offers a safety engineering service perhaps unexcelled.

Always a leader in the safety movement, this Company aids its contractor-policyholders through safety consultants especially trained and experienced in construction work. These specialists set up and follow through proper controls. They give you every assistance in establishing safe operating conditions and practices and in forestalling accidents. With much war-time experience already behind them, they can undoubtedly save *you* worries, as well as serious losses.*

ACCIDENT PREVENTION — PLUS CASH SAVINGS

An opportunity to lower costs (and bids) is provided by cash dividends of 20% or more which American Mutual has always paid. Further savings result from reduced insurance rates — often as much as 30% below average — as reward for good safety records.

* Much accident prevention depends upon *foremen*, who may themselves be new to your particular set-up. Have us send you a free copy of "Foremanship", containing valuable information on hiring and training new foremen, and "refresher" material for experienced foremen. American Mutual Liability Insurance Company, Dept. O20, 142 Berkeley Street, Boston, Mass.

American Mutual Liability Insurance Company

AMERICAN MUTUAL — WORKS FOR YOUR SAFETY

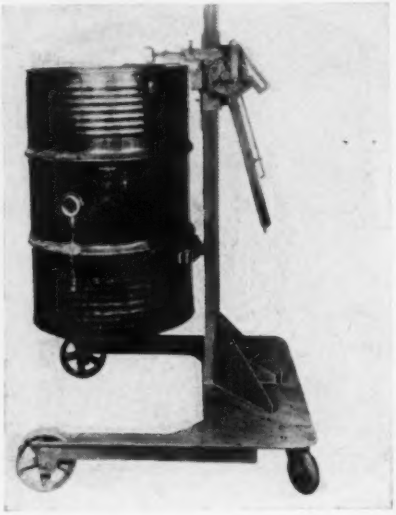
Admitted Assets	$47,908,092.19
Liabilities	40,659,020.90
Surplus to Policyholders	7,249,071.29

As of December 31, 1941

that uses up to six electrodes at a time, depending on the size and nature of the part to be prepared. Small parts may be prepared with this equipment as easily as large shafts, since there is no excessive heating of the base metal, or disturbing of its physical characteristics.—*Metallizing Engineering Co., Inc., Long Island City, N. Y.*

Barrel Carrier

A new 14-in. lift model Ernst carrier with built-in brake for placing and removing 55-gal. drums on and off skids, scales and platforms has been announced. The built-in brake provides smooth, slow-



er and easier lowering of the container from the top 14-in. position. To raise the container a full 14 inches off the floor, the handle is lowered from the up position to the horizontal position, where it automatically locks. By unlocking the handle and applying the brake, the container is lowered to the floor.—*Ernst Carrier Sales Co., 1456 Jefferson Ave., Buffalo, N. Y.*

New Type Trailer

The Electric Wheel Co. has announced a number of design improvements in its caster wheel trailer, the improvements including a newly designed automatic coupler, stronger all-welded fabricated casters, and guaranteed semi-steel wheels. The trailer, identified as No. 1002, has a 4,000-lb. capacity and an all-welded unit steel frame. The unit has two caster wheels for short turning and easy maneuvering, and trails accurately in trains. It is especially suitable for use in freight terminals, warehouses, docks and other services where floor conditions are suitable and also where a combination of hand use and power drawn trains is required.—*The Electric Wheel Co., Quincy, Ill.*

Flexible Shaft Machine

A line of radial type flexible shaft machines manufactured by Wyzenbeek & Staff, Inc., of Chicago, is available. These radial type models are intended for use wherever suspension type machines are difficult to hang and where floor or bench machines would be obstructions to the operator. Utilizing radial type construction to increase the range of usefulness of flexible shaft machines, it is contended by the manufacturers that these models assure wide maneuverability of the machine for speed and accuracy of operation, and at the same time permit complete bench or floor clearance so that the machine itself will not in any way interfere with the operator. The manufacturers say that radial type construction is now available for all of their multiple speed flexible shaft machines.—*Wyzenbeek & Staff, Inc., 838 West Hubbard St., Chicago, Ill.*

Mechanized Sweeper

A mechanized sweeper for the smaller and medium sized plant that can get into close places and, in the open area, cleans at the rate of 16,000 sq.ft. per hour, has been announced by the Moto-Mower Co. This model, designated as

the Detroit Moto-Sweeper, is operated by one person, and for the average plant provides a whole sweeping department. Users report substantial savings upwards of 50 percent, and more in their cleaning expense, the manufacturer says. The unit is said to be as easy to operate as a carpet sweeper, the operator just walking along as the machine sweeps.—*Moto Mower Co., Industrial Sweeper Division, Detroit, Mich.*

New Respirator

The widely used aluminum model Dustfoe respirator, manufactured by Mine Safety Appliances Co., is now avail-

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Corona, L. I. — The Jaeger-Lembo Machine Co.
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New York—Hubbard & Floyd, Inc.
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Worthington Pump and Machinery Corp.

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Buy 'em, rent 'em, get 'em fixed... he's a good man to depend on when you're in a jam or want to *keep out* of one. He's the Worthington distributor, the man who handles Blue Brutes — compressors, rock drills, air tools.

If you need a Blue Brute — or several — *fast* . . . he'll do his darndest to get it to you as soon as possible after you hang up your phone. If your Blue Brutes are facing a stiff schedule, he's the man to send them to for a "physical" — a wise precaution these days when replacements are hard to get. If rough treatment has turned up bruises or breaks, he's got a "first aid kit" of supply parts and repair "know-how" that will restore their pep and vigor.

They make quite a team. Rugged, easy-breathing Blue Brute Air Compressors with the improved and famous "Feather* Valve" . . . easy-handling Blue Brute Rock Drills and Air Tools for a wide range of work . . . and capable, cooperative Blue Brute Distributors whose job is helping you get *your* job done.

Behind the Fighting Fronts with

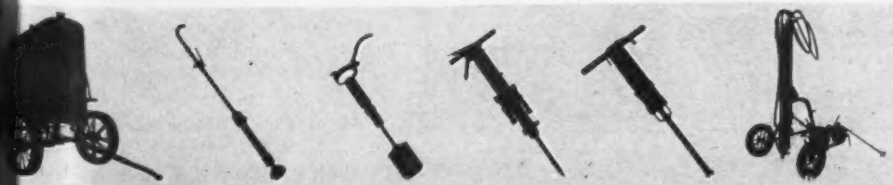
BLUE BRUTES

Blue Brutes on the Alaskan highway help punch through the vital life line that will help the U. S. Army smash the Japs! In addition, Blue Brutes are at work today on hundreds of Army, Navy and Air Force projects all over the country — in "uniforms" of olive drab and battleship gray, instead of customary blue.‡

*Reg. U. S. Pat.
‡Blue Brute Compressors and Air Tools are painted olive drab for the Army and battleship gray for the Navy.

Get more WORTH from air with WORTHINGTON

BUY BLUE BRUTES



Compressors from 60 to 500 cu. ft. capacity in mountings to suit all jobs. Rock Drills and Air Tools that have always set the pace for easy operation — available in a wide range of weights and sizes.

WORTHINGTON

Worthington Pump and Machinery Corporation, Harrison, N. J. Holyoke Compressor and Air Tool Department, Holyoke, Massachusetts

Everything you want to know about assembling or disassembling a Fuller Transmission is covered step by step and completely illustrated in this new book: "Mechanic's and Driver's Handbook."

Conveniently thumb indexed so you can turn to the section you need without stopping to look it up on a "contents page." Pocket size. No sales talk—no advertising. Just the facts you want to know. Truck service men and mechanics who are entrusted with the maintenance of Fuller Transmissions are invited to order their FREE copy from our Service Department.

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All types and capacities for all conditions. Send for Catalog.

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able in all-plastic model the company has announced. Known as the Clear-Vue model Dustfoe, it is said to be an efficient compact, lightweight respirator made of transparent plastic—durable, odorless, non-corrosive and a non-conductor of electricity and heat. The transparent construction makes possible the inspection of the filter for proper insertion and seal without removal from the respirator. A plastic catch on the filter case locks positively in place only when the filters are in correct position. The unit is said to be comfortable to wear and gives approved protection against all pneumoconiosis-producing, nuisance or toxic dusts.—*Mine Safety Appliance Co., Pittsburgh, Pa.*

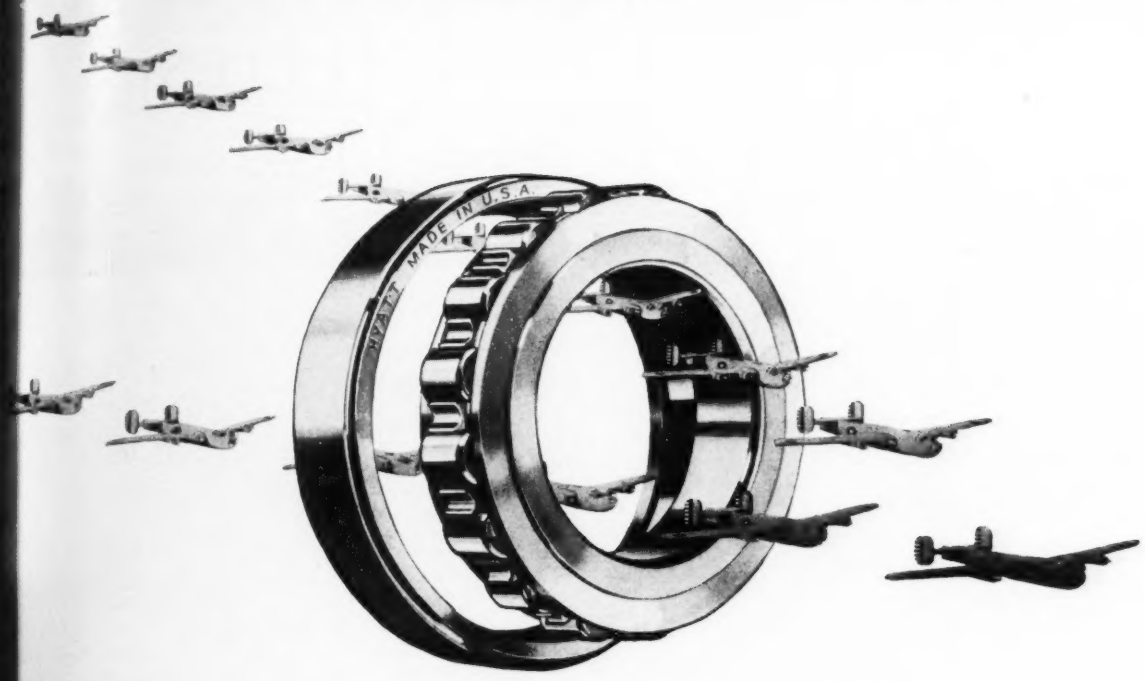
Excavator Force

Posing in a striking contrast of size these two shovels illustrate the extremes of the P&H excavator line. The big 5-yard Model 1500 P&H electric stands over 35 ft. from ground to boom point

with overall length of about 60 ft. The ½-yd. Model 150, known as the "all-around" excavator that goes anywhere, features the quick conversion to crane, dragline, hoe, etc. Both models have P&H low-pressure hydraulic control for actuating clutches and brakes.—*Harnischfeger Corp., 4513 W. National Ave., Milwaukee, Wis.*

Bender

A device seemingly made to order for the critical raw material situation and rush of war production is Tal's Prestal bender, said to be the only portable hydraulic bending machine that will reliably produce a smooth, even bend on iron and steel bar and pipe in a single, simple operation. Said to be already in successful operation in all kinds of industrial outfits as well as by contractors, the machine saves time, material and labor. The bender is able to bend pipe and bars without heating and without filling, is adaptable to any job with a quick changeover to various pipe sizes and to give uniform bends.—*Tal's Prestal Bender, Inc., Milwaukee, Wis.*



High Precision

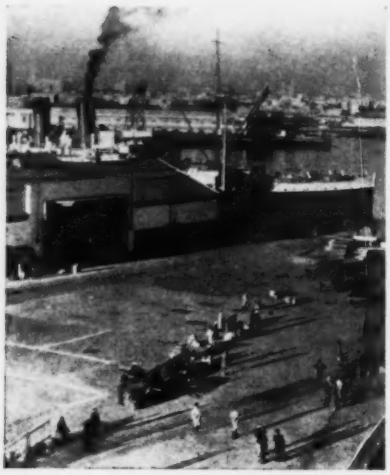
Aviation is but one of the many important applications where Hyatt Roller Bearings are battling the Axis.

Their proved performance under fire in aircraft as well as in tanks, guns, ships and trucks . . . their wartime round-the-clock operation in factories, on farms and railways . . . all reflect the many important advantages of their advanced design and high precision manufacture.

This is the kind of bearing precision and performance which builders and users of contractors' equipment know well over the many years we've served, and will continue to serve, in the brighter years ahead.

Hyatt Bearings Division, General Motors Corporation, Harrison, N. J.

HYATT ROLLER BEARINGS



IN CASABLANCA

3,496 Miles from the U. S. A.

But there, in that heat simmered city on the North Coast of Africa, you will find Layne Well Water Systems identical with those in your own city. Built by Layne engineers, these Layne Wells and Pumps have long maintained their unmatched records of high efficiency, long life and consistent dependability.

Whether in Casablanca—or in any of hundreds of other cities in all parts of the world, Layne Well Water Systems have the quality and ruggedness that keep them going, even under terrific and long sustained overload. Every feature of their design is based upon the highest engineering skill—and then thoroughly proven in prolonged tests under the most rigorous conditions.

In all of the hundreds of installations made for Military and Naval needs in the rush for troop training and war need manufacturing, not one has failed. At present nearly 100 percent of Layne production and service is for war necessity but every effort is being made to repair and keep private and municipal installations in operation.

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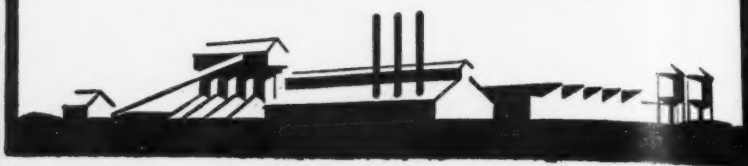
Layne-Central Company	Memphis, Tenn.
Layne-Northern Company	Mishawaka, Ind.
Layne-Louisiana Company	Lake Charles, La.
Louisiana Well Company	Monroe, La.
Layne-New York Company	New York City
Layne-Northwest Company	Milwaukee, Wis.
Layne-Ohio Company	Columbus, Ohio
Layne-Texas Company	Houston, Texas.
Layne-Western Company	Kansas City, Mo.
Layne-Western Co. of Minn.	Minneapolis, Minn.
International Water Supply, Ltd.	London, Ont.

WORLD'S LARGEST WATER DEVELOPERS

MANUFACTURERS' ACTIVITIES



WENTWORTH BROWN has been appointed manager of production of the BROWN Co., Berlin, N. H., replacing John D. McCrystle who resigned recently. Mr. Brown, who has been manager of production for the corporation, was recently elected vice president, and will continue to hold this position in addition to his new duties. He is the son of O. B. BROWN, director of the company, and a grandson of the founder of the organization.

The A. P. GREEN FIRE BRICK CO. of Mexico, Mo., recently was awarded the Maritime Commission award of merit for its work toward furthering the war effort.

JOHN S. MORRIS has been appointed methods engineer for BY-PRODUCTS STEEL CORP., of Coatesville, Pa., a subsidiary of LUKENS STEEL CO. In his new position Mr. Morris will carry on special development work in connection with improved methods. Mr. Morris previously was employed by the Bethlehem Steel Co. at its Sparrows Point, Md., works and in 1941 became assistant general manager of the steel division of Alan Wood Steel Co. He joined Lukens Steel Co. in January, 1942.

What is said to be the first American Red Cross first aid detachment to be organized in an industrial plant was formed recently at the Passaic, N. J., plant of the MANHATTAN RUBBER MFG. DIVISION OF RAYBESTOS-MANHATTAN, INC.

The J. McMEEKAN Co. of Southern Rhodesia, Africa, is now a manufacturer of meehanite castings, according to an announcement by the MEEHANITE METAL CORP. of Pittsburgh, Pa.

The PEERLESS PUMP DIVISION of the FOOD MACHINERY CORP. has announced appointment of DAN R. RANKIN as acting chief engineer of the company. Mr. Rankin has been associated with Peerless for the past five years and previously was assistant to the chief engineer. He is a graduate engineer of the University of California, and is credited with many developments and innovations in design of Peerless pumps.

The BUDA CO. has announced the appointment of R. C. WIETERSEN, as director of purchases for the company. Mr. Wietersen is in complete charge of purchases of equipment and material for Buda gasoline and diesel engines, radial diesel engines, railroad equipment, lifting jacks, and other products of the company.

The ROBINS CONVEYING BELT CO., manufacturers of materials handling machinery, have announced the appointment of JOHN T. HOYT as comptroller and R. C. Gray as works manager.

Ceremonies connected with the Army-Navy "E" award to the main plant of the STANLEY WORKS were held recently at the plant in New Britain, Conn.

The men and women of the R. G. LeTOURNEAU, INC., plants at Peoria, Ill., and Stockton, Cal., were awarded the coveted Army-Navy "E" award for high achievement in the production of war material recently. In a brief ceremony, over 4,000 LeTourneau workers and special guests paused for half an hour on the production line in the Peoria plant to receive this tribute. Among those attending were L. B. NEUMILLER, president of the CATERPILLAR TRACTOR Co.

WAR PLANT DISTRIBUTION SYSTEM IS ENGINEERED TO CONSERVE MATERIALS

Result:

6400 pounds of Copper saved

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• **Selecting the Right System**—Wide application experience in all types of industries enables Westinghouse engineers to recommend the system best fitted to your plant.

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• **Improving Power Factor**—through use of capacitors, can often save installation of new feeder lines. Westinghouse engineers are in a position to make such practical recommendations.

A New England war plant planned to install a distribution system requiring 44,200 pounds of copper. Westinghouse engineers recommended a more flexible, better-protected system using 6400 pounds less copper.

Savings like this prove that "custom-fitting" the distribution system to the job helps to conserve critical materials.

There is no one universal distribution system suited to all plants or all industries. That's why Westinghouse plans and builds *all* types. The one that will best fit your plant is the one that takes full account of the nature, density, and location of load—with the least use of critical materials.

Any system recommended is designed to use standard distribution equipment. No time is lost in building special apparatus.

If you want fast action, call our local office. Or send for the helpful booklet shown below. Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

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QUICK FACTS ABOUT PLANT DISTRIBUTION SYSTEMS

Keep up to date on latest plant distribution systems. Send for Booklet B-3152 which briefly describes different plant distribution systems, and points out the advantages of each.

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PLANTS IN 25 CITIES... OFFICES EVERYWHERE

THE PUMP THAT *Stays on the job!*

ON the really *tough* pumping jobs where dirt, sand and grit take rapid toll of ordinary pumps, rugged CARVER centrifugals are setting records for consistent high performance. Long, trouble-free service is a job-tested *fact* about CARVER pumps that will mean dollars and hours saved on *your* job, for these outstanding centrifugals maintain their lightning-fast prime, their extremely high efficiency, even after thousands of hours of pumping.

For a pump that starts out ahead and *stays* ahead—specify CARVER on your job!

•

Gas engine, electric motor or belt-driven CARVER centrifugals are built in capacities from 5,000 to 125,000 G.P.H.

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Get the *facts* about these efficient, long-lived pumping units — write NOW for your copy of the CARVER pump catalog.

CARVER PUMP CO., Muscatine, Iowa

CARVER CENTRIFUGAL Certified PUMPS

(shown in photo), R. C. LeTOURNEAU, president, and D. M. BURGESS, vice president and general manager.

"Don't let this happen" is the heading of the first of a series of posters now being distributed by GENESEE TOOL CO., of Fenton, Mich. Designed to teach workers the importance of tool care, the first poster shows a tool crib with empty shelves and with a sign across the window reading "Closed due to tool shortage." The poster is designed to bring home to the worker the relationship of proper care of tools to the continuity of his own job, and is designed to offset the fact that a worker who breaks a tool knows that he can get another one by applying at the tool window.

CHARLES E. RYAN, 58, president of the LINDE-GRIFFITH CONSTRUCTION CO., of Newark, N. J., died recently.

The WALTER BATES CO., INC., has changed the address of its general office from 208 So. LaSalle St., Chicago, Ill., to 1707 Rowell Ave., Joliet, Ill.

W. W. LEWIS, 55, assistant vice president of the AMERICAN ROLLING MILL CO., died recently. A native of Baldwyn, Miss., Mr. Lewis was a graduate of Cumberland University at Lebanon, Tenn., and started his business career as an employee of the JONES & LAUGHLIN STEEL CORP. At the time of his death he had been general manager of the London branch of Armco International Corp. before becoming assistant vice president.

The LIDGERWOOD MFG. CO. of Elizabeth, N. J., manufacturers of hoists and derricks, recently was the recipient of the joint Army-Navy "E" award, highest mark given by the armed services to civilian organizations for excellence in war production work.

A pioneer in the rubber machinery business in Akron, Ohio, ANDREW J. FLEITER, 60, died there recently. He was president of the AKRON STANDARD MOLD CO. and the ELECTRO-MELT STEEL CASTING CO., and vice president and general manager of the BARBERTON FOUNDRY CO. at Barberton, Ohio.

WILLIAM McGEACHY, general plant superintendent of the NORDBERG MFG. CO., of Milwaukee, Wis., died recently at the age of 71.

BARRETT AND HILP, general contractors of San Francisco, Cal., have announced

POSTWAR 3rd FRONT

A MESSAGE TO BUILDERS AND ENGINEERS WHO ARE DOING THEIR POSTWAR THINKING NOW···

YOU realize better than anyone else that postwar construction will be the Third Front—and that welding will replace prewar methods in the structural field, right on up through bridges and buildings.

As one of the world's pioneers in the art of *building things with welding*, let us make this suggestion to you. Remember always that no other single factor is as important in any welding operation as the *welding electrode itself*. Everyone who does welding on a large scale eventually learns this truth. But it is not necessary to learn it the hard way!

Smith Certified Welding Electrodes, originally made by us for our own use in our own plants, are now offered to others who do welding. Packed in each box, and a definite part of each Smith Welding Electrode, is the Smith welding *experience*—an experience that has on numerous occasions demonstrated its value to others who do welding.

Mild Steel...High Tensile...Stainless Steel

WELDING ELECTRODES

Made by welders . . . for welders

A.O. SMITH Corporation

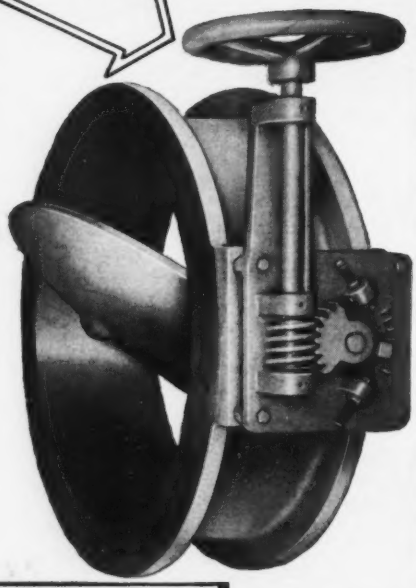
MILWAUKEE · WISCONSIN · HOUSTON · TEXAS

6 Hand Wheel Revolutions

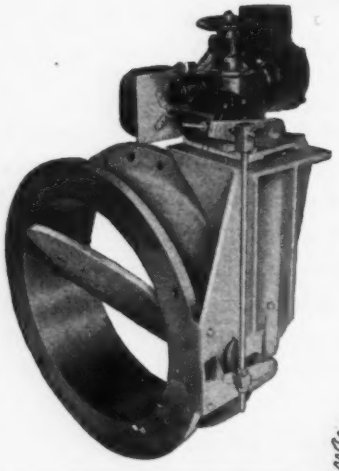
Complete Full Vane Movement

Designed for the control and wedge-tight shut-off of any material that flows or is forced through a pipe

Six revolutions of the hand wheel fully open or close this R-S Butterfly Valve. Compare this quick action with that of ordinary valves. Consider, too, that R-S Valves are comparatively light in weight. They effect a considerable saving in installation costs since less space and supporting structure are required.



15 to 900 p. s. i.



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Here is a simplified, precise and entirely Automatic Butterfly Valve for the shut-off and control of liquids and gases. Hand wheel for manual operation in case of current failure. Available in iron or steel; sizes to 84 inches.

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Detailed information and catalog furnished upon request.

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R-S PRODUCTS CORPORATION
116 Berkley Street • Philadelphia, Penna.

R-S Streamlined BUTTERFLY VALVES

the appointment of the A. E. NELSON Co., 300 Montgomery St., San Francisco, as their agency to handle all advertising and public relations activities.

RAYMOND M. DENNIS has been appointed assistant to the president of BY-PRODUCTS STEEL CORP., Coatesville, Pa. In his new position Mr. Dennis will have charge of the staff and general administrative work for the corporation, a subsidiary of LUKENS STEEL CO. Prior to his appointment, Mr. Dennis had been general manager of the flanging department of Lukens, in charge of estimating, sales and production of flanging.

In order to expedite its engineering service and engineering survey work in expanding operations in the New York area, the CARDOX CORP. has announced appointment of C. R. VAN GORDER as district engineer.

LOUIS F. THEURER, industrial sales manager of the Milwaukee paint division of the PITTSBURGH PLATE GLASS CO., has been appointed West Coast divisional director, succeeding FLOYD S. GREEN whose retirement has been announced. R. L. OGLE, now industrial paint sales representative in the Chicago territory, will be industrial sales manager at Milwaukee.

R. B. HARVEY, sales manager of the NOVO ENGINE CO., was appointed chairman of the contractor's pump bureau at an annual meeting in Chicago recently. The pump bureau is an organization composed of the principal manufacturers of contractor's pumps. It determines all standards of the manufacture of pumps used in the construction industry. Mr. Harvey also has recently been appointed to the Contractor's De-Watering and Supply Pump Manufacturer's Advisory Committee, and the Air-Cooled Engine Industry Advisory Committee of the War Production Board.

The ROGERS DIESEL & AIRCRAFT CORP. of New York has announced the acquisition through its EDWARDS CO. division of the IDEAL POWER LAWN MOWER CO.

The HEITZMAN SAFETY BLASTING PLUG CORP. of Shamokin, Pa., has appointed CHARLES CAULFIELD of 227 East 57th St.

POMONA PUMPS STRETCH YOUR PUMPING DOLLAR

TAKE ADVANTAGE OF CONSTRUCTION

ARE YOU TAKING FULL ADVANTAGE OF POMONA'S MANY CONSTRUCTION FEATURES?

Pomona owners are doubly fortunate in these times because no other type pump can match Pomonas for high efficiency . . . for adaptability to varying job requirements . . . for low maintenance and operating costs . . . and for all-around ability to handle virtually any pumping application encountered.

Among the *many* construction features that make Pomonas so uniformly efficient under a wide variety of operating conditions, the following are typical . . .

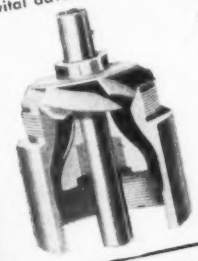
VERTICAL DESIGN

Because Pomonas are *vertical* pumps they require a minimum of floor space . . . in fact, can be mounted directly *over* tanks, vats, or sumps. No costly foundations are needed, no need to disturb existing plant installations. In addition, they require no priming to start, so may be located in out-of-the-way places unsuited to other equipment or can be operated by remote control. ***No other pump is so easy to move from one job to another. No other pump operates with so little attention!***

Let your nearby Pomona dealer check over your installation and suggest ways you can make greater use of the many advanced construction features incorporated in your Pomona pump!

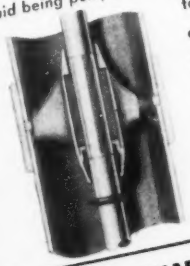
SEMI-OPEN IMPELLERS

Pomona's Semi-Open Impellers and Bulbous Vaned Pump Bowls represent a vital advancement in both design and performance. Pomona impeller clearance can be adjusted quickly and easily at the pump head, permitting pump capacity to be varied up to 60% of design point without costly throttling. Semi-open impellers will also handle gritty, pulpy or fluctuating flows more efficiently, and greatly minimize risk of vapor, gas or air locking. **Thus, Pomonas can be quickly adapted to a wide range of pumping requirements and fluids with uniformly high operating efficiency!**



WATER LUBRICATION

In Pomonas, ALL bearings below the motor head are self-lubricated by the fluid being pumped. There are no oil tubes or grease chambers to leak, therefore no risk of contaminating either product or equipment. Also, because lubrication is foolproof, positive, Pomonas take care of themselves without need for frequent attention. **You can use your Pomona for practically any pumping job in your plant with perfect safety to the pump and to the product!**

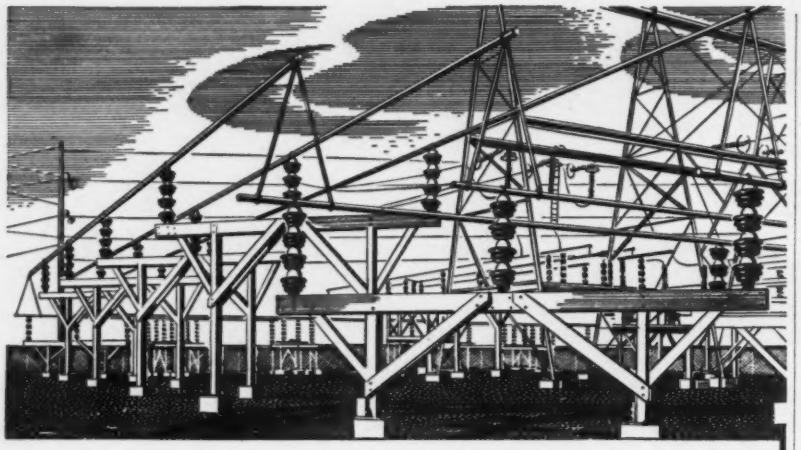


OPEN DRIVE SHAFT

Pomona impellers are driven by an open drive shaft which eliminates the buying, installing and servicing of a separate housing when conversions are made. Because there are no oil tubes or grease chambers, Pomonas handle fluids under a wide range of temperatures, further increasing their versatility. Finally, the pump can be lengthened or shortened by simply adding or removing standard length shaft sections . . . can be converted from deepwell primary water supply to close-coupled industrial pumping—or vice versa—at minimum cost. **Pomona's need never be idle!**

POMONA
Water-Lubricated
PUMPS

DIVISION OF JOSHUA HENDY IRON WORKS



WOOD Takes Over Another Exacting Assignment

POWER COMPANIES can't gamble on reliability when they build. Their structures go up to stay. So, when they build with Wolmanized Lumber*, you know they are convinced of its worth.

THIS LUMBER is going into a lot of the utilities' construction, releasing scarce materials that are badly needed elsewhere for fighting equipment. There is no question of its ability to make good on this work. Service records covering millions of feet of Wolmanized Lumber, some of it on the toughest kind of assignments for over seventeen years, bear witness to this fact.

WOLMANIZED LUMBER is ordinary wood "alloyed" with Wolman Salts* preservative to make it highly resistant to decay and termite attack. Vacuum-pressure impregnation under exacting technical control accomplishes this. Wolmanized Lumber is clean, odorless and paintable. The preservative is non-inflammable.

IT COSTS LITTLE more than ordinary wood construction. All of the advantages of building with wood are retained; easy, fast erection, lightness, strength and resilience. Maintenance costs are certain to be low, because of the fine performance of Wolmanized Lumber under adverse conditions. American Lumber & Treating Company, 1649 McCormick Building, Chicago, Ill.

*Registered Trade Mark

"Alloyed" FOR ENDURANCE

WOLMANIZED LUMBER

New York, to be gener... sales agent ... the sale, demonstration ... distributi... of their new asbestos ... blasting plu... throughout the United S...

EDWARD J. SCHROETER, ... president an... general manager of the H... ER MFG. Co., died recently. Grandson ... of one of th... founders of the company, ... assumed th... presidency in 1940.

A graduate of Cornell University in 1914, he became a part of the original organization that launched the JORDAN MOTOR CAR CO. of Cleveland, and in 1923 he organized the MACOUSTIC ENGINEERING CO. of Cleveland, a firm that pioneered in the field o... sound control in churches, auditoriums, offices and various other types of large buildings. He headed a reorganization program for the TEACHOUT CO. of Cleveland, a large millwork and lumber concern, resigning that position when he took over the Huber assignment in 1940.

JUDSON C. BURNS, 72, a pioneer electric appliance distributor, died recently at Philadelphia. He had been in the business of selling appliances in Philadelphia since 1910, and at his death was president of JUDSON C. BURNS, INC., 31st and Oxford Sts., distributor for GENERAL ELECTRIC specialty appliances.

The appointment of A. F. DOBBRODT as southern district manager for the CARBOLOY CO., INC., has been announced. Mr. Dobbrodt, who will make his headquarters in Birmingham, Ala., has been with Carboloy since 1929, his activities covering design, sales and servicing of Carboloy cemented carbide tools in the Chicago, Milwaukee, Rochester and Cleveland areas.

A victory sign towering 40 ft. above the parking lot at an aircraft plant designed and being erected by the AUSTIN CO., has greeted more than 6,000 construction workers there since Dec. 7. The sign was unveiled without ceremony beyond the playing of martial airs. Showing a soldier and a war worker side by side, the sign says "We will build and fight our way to Victory."

ALFRED C. RIMMER, treasurer of the FURNIVAL-RIMMER CO., of Philadelphia, Pa., died recently. Born in England in 1887, Mr. Rimmer came to this country in 1897 and became a marine engineer.

March, 1940, he joined G. E. FURNIVAL to form the Furnival-Rimmer Co.

A. MAXWELL, an employee of the B. F. GOODRICH CO. since 1933, has become a member of the requirements and capacities section, rubber branch, War Production Board.

The Army-Navy "E" burgee has been awarded for excellence of production to the General Asbestos & Rubber Division of RAYBESTOS-MANHATTAN, INC., North Charleston, S. C.

HARRY EDMUND NEWELL, assistant chief engineer of the NATIONAL BOARD OF FIRE UNDERWRITERS, of New York City, has received the James Turner Morehead medal for 1941 for his "leadership in developing standards for installation and operation of acetylene equipment and systems." The Morehead medal is given annually by the International Acetylene Association for outstanding work in the industry or for advancements in the production or use of calcium carbide or acetylene. Mr. Newell has been affiliated with the National Board of Fire Underwriters since 1909, most of this time working with the Committee on Fire Prevention and Engineering Standards.

HERMAN FRANCK has been appointed general manager of ALCO PRODUCTS, INC., Dunkirk, N. Y., a subsidiary of the American Locomotive Co.

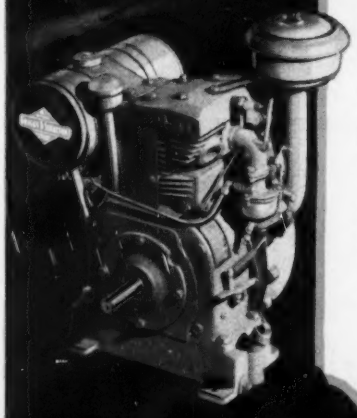
In a letter from the War Department the HERCULES MOTORS CORP. of Canton, Ohio, was recently informed that the Army-Navy "E" award has been granted to the men and women of the corporation for production excellence. Presentation was made during January.

The UNIVERSAL ATLAS CEMENT CO., U. S. Steel Corp. subsidiary, has announced the following changes: R. S. HUEY, superintendent, Duluth, Minn., plant, is retiring after 40 years of service; E. J. AMAN, local auditor, Duluth plant, retiring after 48 years; FRED ROBINSON, assistant superintendent, appointed plant manager, Duluth; MARTIN E. LINQUIST, operating foreman, appointed assistant plant manager; and FREDERICK N. FREDRICKSEN, chief clerk, appointed local auditor.

W. I. GALLIHER has been appointed executive sales manager of the Columbia Chemical Division of the PITTSBURGH PLATE GLASS CO., manufacturers of heavy

"Reel" action at "X"

"Movies" are up front, too, for periods of relaxation. Keeping these "Reels" rolling, is one of our assignments — for the projectors are operated with lighting equipment powered by Briggs & Stratton gasoline motors. This is but one of scores of "special" applications, in addition to many major ways by which Briggs & Stratton motors are serving our armed forces.



OWNERS of 4 cycle air-cooled Briggs & Stratton motors are fortunate. They are not only assured of dependable power during the present emergency, but they know that these sturdy gasoline motors embody built-in features and quality that insure constant delivery of capacity power *year after year.* Now, when all equipment is being operated "around the clock", it is most important to keep your Briggs & Stratton motor in tip-top condition. It will pay in extra performance and *even longer life.*

•

A book containing Operating Instructions, Adjustment and Repair Information is available on request. When writing, be sure to mention the model letter of your motor.

BRIGGS & STRATTON CORP.
MILWAUKEE, WIS., U. S. A.

FOR VICTORY
Buy U. S. War Bonds

4 CYCLE
BRIGGS & STRATTON
GASOLINE MOTORS

Does static annoy you on your radio?

ON A BLUEPRINT PRODUCTION PROGRAM STATIC IS A *CURSE!*

REVOLUTE *revolving* CONTACT LICKS IT BEFORE IT STARTS

The Revolute 3H Automatic Blueprinting Machine does away with the static that can cause so much damage and lost time in your blueprinting department.

Revolving Contact, a Revolute feature, permits tracings and blueprint paper to ride *together* around the revolving glass cylinder. There is *no rubbing* to cause static. Valuable tracings don't stick to the paper to be carried through into the developing bath . . . nor do tracings adhere to the glass to be crumpled and torn. Feeding is faster and more accurate because tracings need not be chalked or powdered.

In these days, when a slow-up anywhere along the line can hamper output of vital war materials, this is a feature worth checking. There's a definite place in your department for Revolute 3H Automatic Blueprinting equipment . . . designed all the way through for high speed production of better blueprints . . . at less cost.

For a complete list of outstanding Revolute features see the Paragon-Revolute Blueprinting Equipment Catalog No. 1041. Write for your FREE copy today. Dept 2-R.

FIGHT YOUR PRODUCTION BATTLES WITH BLUEPRINTS

BLUEPRINT paper costs half as much as paper for other purposes . . . about ½c per sq. ft.

BLUEPRINTS give you good clear working copies from VanDyke negatives.

BLUEPRINTS improve with age . . . there are no chemicals left in the paper to turn yellow or destroy the paper.

BLUEPRINTS are easier to read.

BLUEPRINTS stand up better in shop use . . . will take more handling . . . don't show soiling. Accidental marks can't lead to misinterpretation.

BLUEPRINTS are authoritative . . . a direct order from the Engineering Department . . . Men in the shop are accustomed to them.

BLUEPRINTS are not easily sabotaged . . . alterations are immediately apparent.

dustrial chemicals. Mr. Galliher, formerly director of sales, succeeds ELI INKLER who has been retained in the apacity of executive consultant.

the Beloit works of FAIRBANKS, MORSE Co., a signal honor was recently bewed upon the company's many thousds of war workers. Attractive displays re installed at the three main gates of plant featuring an army man on the t of the entrance, a sailor on the right d an F-M factory worker in the center. e two men of the army and navy are wn standing at attention, saluting the tral figure of the war worker, indicae of the honor shown by the armed ces to those whose uniforms are overs.

THUR W. HERRINGTON, chairman of the ard of MARMON-HERRINGTON CO., Inapolis, is featured in the portfolio personalities entitled "Automotive erlins" in the January issue of *Coronet agazine*. Accompanying the personality etch are six other short biographies of aster mechanics and builders who are embers of the Automotive Council for ar Production.

mployees of the Ontario, Cal., branch of the GENERAL ELECTRIC CO., recently received the Army-Navy "E" award. The plant produced electrical home appliances during peacetime, but is now 100 percent in war work. A. C. SANGER, shown in the accompanying illustration, manager the General Electric Bridgeport, Conn., ant, crossed the continent especially the ceremony to act as recipient of " pins presented by representatives of e armed services.

ppointment of GORDON F. HESS as disct sales manager at Detroit for REPUBC STEEL CORP. has been announced by e company.

AY M. RAFF, 68, a director of the DIAOND PORTLAND CEMENT CO. and its cretary-treasurer until he retired a year o, died recently in Canton, Ohio.

e MORETRENCH CORP. has announced e removal of its Mid-western warehouse om Joliet, Ill., to larger quarters at 37 So. Christiana Ave., Chicago, Ill.

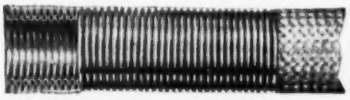
ith all its employees looking on, the my-navy "E" award, highest recognin given to civilians for war production, s formally presented to the MACWHYTE ., at its Kenosha, Wis. plant, recently. e company took over the auditorium of

FLEXPEDITE

Your Conversion—Assembly—Production with

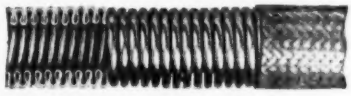
REX-WELD
Flexible Metal Hose

Rex-Weld Hose—Annular Corrugations



RW-80 Unbraided — RW-81 Braided

Rex-Weld Hose—Helical Corrugations



RW-90 Unbraided — RW-91 Braided

General Data

	STEEL	BRONZE
Sizes	To 4" I.D.	To 4" I.D.
Pressures	To 14,500 p.s.i.	To 14,500 p.s.i.
Temperatures	To 1000° F	To 450° F.
Lengths	To 50'	To 50'

Use Chart

	*STEEL	BRONZE
Saturated Steam		✓
Superheated Steam	✓	
Sulphur Bearing Oil	✓	
Oxygen		✓
Ammonia	✓	
Carbon Dioxide	✓	
Sulphur Bearing Grease	✓	
Critical Vibration		✓
Non-Sparking		✓

*Protective Coatings Can Be Applied for Corrosion Protection (To Conserve Critical Copper Bearing Alloys).

Couplings: REX-TITE Mechanical (Re-attachable) Couplings; Solder Couplings; Brazed and Welded Couplings and Flange Assemblies for Rex-Weld Flexible Metal Hose.

Ask for Engineering Recommendations

CHICAGO METAL HOSE CORPORATION

General Offices: MAYWOOD, ILLINOIS

Factories: Maywood and Elgin, Ill.

TRUCK OR TRAIN?

...IT'S *Both!*

WAUKESHA POWERED Auto-Railer* rolls on roads or rails

A truck and a train in a single unit—the Auto-Railer* operates with equal efficiency on either road or rails; is quickly and easily shifted from one to the other. This flexibility is further increased by the versatility of power, speed and control of its Model SRKR Waukesha Engine. Auto-Railer* flexibility is a tremendous advantage in war work. In addition to critical materials, it saves man-power as well as man-hours.

The Model E-1 F-11 Auto-Railer* munitions train shown is used for the transportation of explosives in a large ordnance plant. Its payload capacity is 40 tons—10 tons in the locomotive and 15 tons in each trailer.

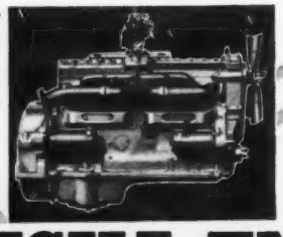
In the Auto-Railer*, the Evans Products Co. of Detroit utilizes not only the greater flexibility of Waukesha Engines but their greater dependability which comes from super power and stamina, smoothness and acceleration, high fuel economy, longer life and lower upkeep.

Get Bulletin 1079.

*Registered Trademark of Evans Products Co., Detroit, Michigan, the manufacturers

WAUKESHA MOTOR COMPANY, WAUKESHA, WISCONSIN
NEW YORK • TULSA • LOS ANGELES

Model SRKR Waukesha Engine



BUY WAR BONDS

★★ MORE POWER FOR VICTORY ★★

WAUKESHA ENGINES

the Kenosha high school for the ce mony.

E. C. FINK, president and chairman the board of MACK TRUCKS, INC., died New York City recently at the age of A pioneer in the truck industry, Mr. Fi had been an officer of the company sin its organization in 1911, and was many years vice president in charge production at the company's plant Allentown, Pa., Plainfield, N. J., a New Brunswick, N. J. Born in Cincinna Mr. Fink started his career with the machine tool firm of Lodge & Shipley, a later served with the PRENTISS TOOL SUPPLY CO. before coming into the Ma organization.

GORDON LEFEBVRE, vice president a general manager of the COOPER-BES MER CORP., announced recently that creases in production to meet governm schedules had been steadily maintained throughout the year. Although the industry in general has been faced with critical shortages in both materials and manpower, Mr. Lefebvre credited record breaking production to intensified research, far-reaching shop training pla and exceptional spirit and enthusia among both factory and office person Production of castings for the first n months period at the Grove City, P plant has practically equalled the ent output for the previous 12-month peri Mr. Lefebvre said.

PHILIP W. METTLING, COOPER-BESSEM compressor expert, stationed at the c porations' Mount Vernon, Ohio plant the past several years, has been tra ferred to the firm's branch office at East 61st St., Los Angeles, Cal.

OTTO D. DEHART, 59, Southwestern d trict manager for the PITTSBURGH-D MOINES STEEL CO. for the past 30 ye died recently at Dallas, Texas.

W. A. NERACHER, founder of the BEA PIPE TOOLS, INC., of Warren, Ohio, h been elected to the newly created p tion of chairman of the board. W. PHILLIS, formerly vice president, becom president and general manager, as result of the meeting of the board of rectors recently.

R. C. WIETERSEN, formerly director purchases for HERCULES MOTORS CO Canton, Ohio, has been appointed to similar post with the BUDA CO. of Harv Ill.

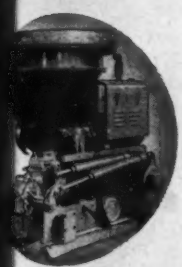
GEORGE SHERRY has been named mana

He does MORE than MAKE them...

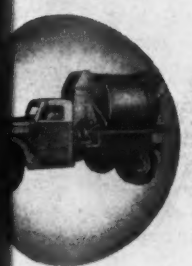
CONCRETE MIXER

WATER PUMP

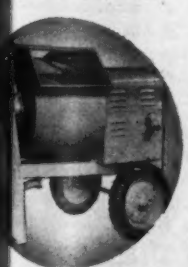
PAVER



PUMPCRETE



MOTO-MIXER



PLASTER MIXER

REX Mechanical Engineering—Rex M. E.—serves Civil Engineering and its contracting organizations.

His business is the design, manufacture, application, selling and maintenance of machinery for mixing and placing concrete and for removing water.

In this country and in many others, he is well known as a manufacturer. He *does* manufacture construction machinery and is proud of it, but manufacturing is only a part of his business.

In addition, he performs the functions of application and selling which are just as much the duties of Mechanical Engineering as are design, manufacture, and maintenance.

Application and selling are the informational and technical services required by civil engineers and contractors for solving problems of capacity, adaptation, application and selection.

For this service he has enlisted a veteran field organization of 75 distributors in the important cities of the country.

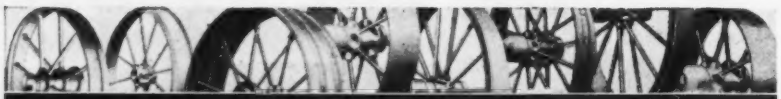
When they require the engineering aid of specialized engineers, they call on the home office of Rex M. E. in Milwaukee.

Through them all, Rex M. E. is learning and applying much that is helpful now and may be still more helpful after V-Day comes.

CONSTRUCTION MACHINERY

Concrete Mixers • Moto-Mixers
Pumpcretes • Speed Prime Pumps
Mortar and Plaster Mixers • Pavers

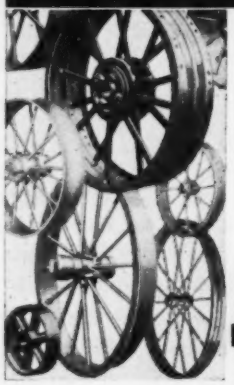
CHAIN BELT COMPANY *of Milwaukee*



IF YOU USE

WHEELS or AXLES

YOU NEED OUR ENGINEERING EXPERIENCE!



WE have cooperated closely with Industry for more than 50 years —producing millions of dependable, efficient steel wheels and axles; each specifically suited to its task. The knowledge gained through all this experience is available to you now —to help you get the utmost service and satisfaction from your "rolling stock". Write today for complete Illustrated Bulletins.

EWC WHEELS

Electric Wheel Co., Dept. NR, Quincy, Ill.

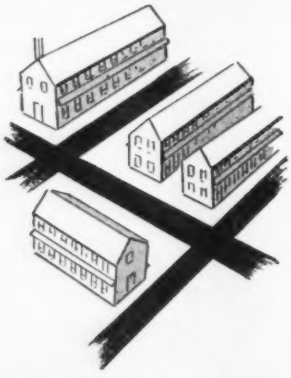
Typical Users of Electric Wheel Products

Gardner-Denver Co., Quincy, Ill., Barber Greene Co., Aurora, Ill., Ingersoll-Rand Co., Geo. Haiss Mfg. Co., N. Y. C., Chicago Pneumatic Tool Co., N. Y. C., Pioneer Engineering Works, Schramm, Inc., West Chester, Pa., T. L. Smith Co., Milwaukee, Wis., LeRoi Company, Milwaukee, Wis., Jaeger Machine Co., Columbus, Ohio.

ASPHALT

for

CANTONMENT STREETS



Various low-cost types of Asphalt construction are ideally suited for cantonment streets where an improved all-weather surface is needed. Asphalt can be easily maintained for as long as it is needed, and can be abandoned at any time without a great investment loss.

Wherever Standard Oil Asphalt products are sold, there is an Asphalt Representative who can give you full information about these and other uses of Asphalt. Write

STANDARD OIL COMPANY (Indiana)

910 SOUTH MICHIGAN AVENUE, CHICAGO

of the tool engineering division of the GOODYEAR AIRCRAFT Corp., Akron, O

One of the world's larg[est] metal work[ing] organizations, the AMERICAN BRAKE SHOE & FOUNDRY Co., will advertise in 194[3] spotlight a little publicized subject—the important role that parts manufacturers are playing in America's war production program.

The Army-Navy "E" award has been presented to the Erie Works of Buc[yrus] Erie Co.

The BUCKEYE TRACTION DITCHER Co., Findlay, Ohio, recently celebrated its 50th anniversary as a manufacturer of trenching machinery.

REO MOTORS, INC., of Lansing, Mich., has been awarded the Treasury Department's War Bond Bull's-Eye flag having achieved the mark of 11.35 per cent participation in the purchase of bonds on the payroll deduction plan.

EVERETT F. CLARK has been appointed marine manager, eastern district of the WESTINGHOUSE ELECTRIC & MFG. Co. Intimately associated with diesel electric propulsion equipment, the application of geared turbine propulsion and electrical auxiliaries on shipboard since graduation from college in 1914, Mr. Clark became manager of the condenser section of the company's power division [engineering] department in 1916. With the exception of two years in the service with the Engineer Reserve Corps, he has been in the company's employ since that time.

The AMERICAN OPTICAL Co. of Southbridge, Mass., celebrated its 110th anniversary of service recently.

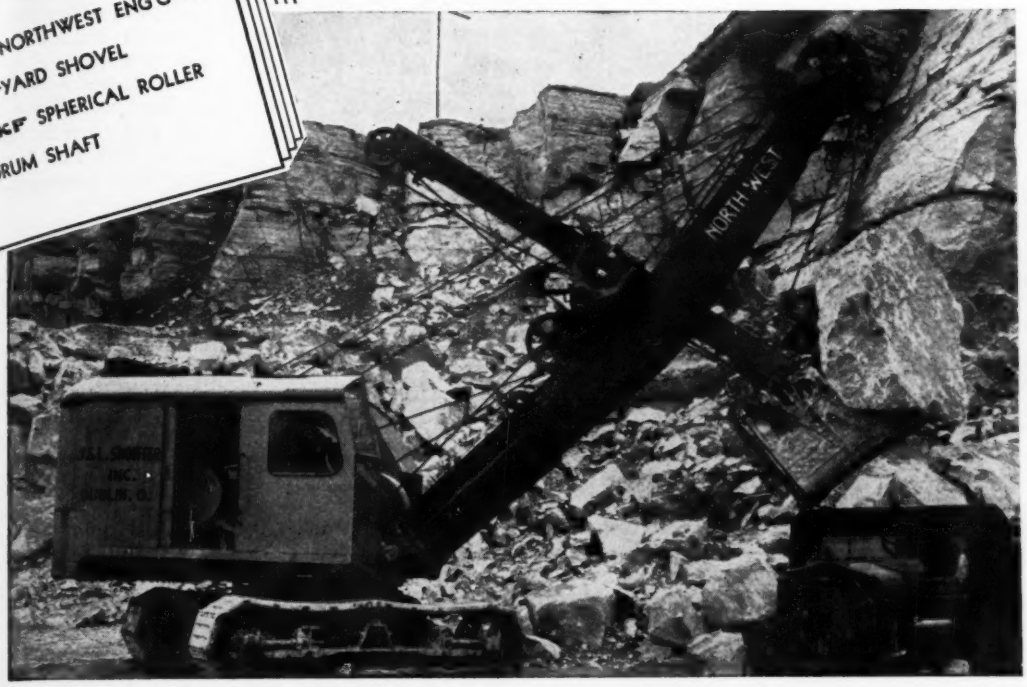
On Dec. 24, James Forrestal, Under Secretary of the Navy, wrote A. G. Pratt, president of the BABCOCK & WILCOX Co. that the company's works in Augusta, Ga., had been awarded the Army-Navy "E" for outstanding production of manufactories.

KARL W. V. NIX, crude rubber and cotton fabric merchant at Akron, Ohio, has been named chief of the northern South American Division of the Board of Economic Warfare's rubber branch.

With cooperation among manufacturers as a keynote, a two day meeting of representatives of leading industries was held recently at Syracuse, N. Y., under the sponsorship of the CARRIER Co.

PLICATION

Manufacturer NORTHWEST ENG'G CO.
Machine 1½-YARD SHOVEL
Bearings SKF SPHERICAL ROLLER
Location DRUM SHAFT



NORTHWEST *shovels put the pull*

ON SKF BEARINGS

As this Northwest 1½-yard Shovel grabs a mouthful of rock and operating cables strain under the load, SKF Spherical Roller Bearings on the drum shaft take it. The self-aligning feature of these bearings enables them to use their full load carrying capacity. They require no adjustments . . . need only infrequent lubrication. All good reasons for their preference on the rugged machines of Industry. If it's a tough job, you can bank on SKF Bearings. 5248

SKF INDUSTRIES, INC., PHILADELPHIA, PENNA.

ARMY E NAVY

SKF
BALL AND ROLLER
BEARINGS

Design Does It and Gives You These Outstanding Advantages

THE ROTOVALVE design provides these unique advantages because the plug:

lifts, rotates and seats . . . assures through, unobstructed flow . . . provides minimum loss, as the loss through a Rotovalve, when open, is no greater than it is through a pipe of equal diameter and length . . . is obtainable in sizes from 6 to 60 inches, with controls that meet a wide-range of services . . . may be operated manually, hydraulically, or by motor.

Enjoy these advantages, just as modern waterworks and new war-material plants are benefitting by them! Specify ROTOVALVES for your next job—*and be doubly* sure!

S. MORGAN SMITH COMPANY YORK, PENN.

BAILEY METERS AND CONTROLLERS

FOR SEWAGE TREATMENT AND WATER SUPPLY . . .

● Venturi Tubes, Weirs, Flumes, Nozzles and other primary elements; Mechanically and Electrically operated Registers and Complete Automatic Control Systems.

BAILEY METER COMPANY

1029 IVANHOE ROAD • CLEVELAND, O.

Bailey Meter Co. Ltd., Montreal, Canada

NEED A BIG Trailer?

La Crosse Makes Them Up To 200 Ton Capacity-

** WRITE OR WIRE **

LA CROSSE TRAILER & EQUIPT. CO.

LA CROSSE, WISCONSIN U.S.A.

Speakers included J. M. BICKEL, head the Carrier planning group; E. C. W[illegible]LER, Carrier president, and others.

ED C. DOYLE, manager of the No[illegible] branch of FROEHLING & ROBERTSON, I[illegible] inspection engineers and chemists, has been transferred to the company's R[illegible]mond laboratory and placed in charge the inspection department covering ment and concrete. J. IRA THOMAS JR. has been transferred from Spar[illegible]burg to the managership of the Nor[illegible] branch.

Army and Navy officials hailed the production record of WARREN WEBSTER Co., Camden, N. J., at a colorful ce[illegible]mony recently marking presentation the Army-Navy "E" burgee.

Election of LOUIS G. BISSELL as chairm[illegible] of the board has been announced MACK TRUCKS, INC. Mr. Bissell, a m[illegible]ber of the law firm of Chadbourne, W[illegible]lace, Park and Whiteside, has served company for many years as a direc[illegible] and counsel. Also announced was election of CHARLES T. RUHF as pr[illegible]dent of MACK MFG. CORP., and execu[illegible] vice president of the parent company.

CHARLES H. EISENHARDT has been pointed assistant manager of the e[illegible] trical, wire rope and construction m[illegible] rials sales division of the AMERICAN STEEL & WIRE CO., a UNITED STATES STEEL subsidiary. He succeeds R. L. RHODES, who resigned recently. Mr. Eisenhardt has been associated with the wire company since May, 1925 and has been successively a price clerk, correspondent and salesm[illegible] in the Baltimore office before being signed to the position of special s[illegible] representative in Washington, D. C. H[illegible] new appointment is effective Feb. 1.

G. W. WIGLE of Hamilton, Ont., has b[illegible] named president and general manager the HAMILTON BRIDGE CO. LTD., succe[illegible]ing the late F. W. Grant.

A. W. HERRINGTON, chairman of [illegible] board of directors of the MARM[illegible] HERRINGTON CO., has been elected a [illegible] rector of the Army Ordnance Asso[illegible] tion.

THE AMERICAN BRAKE SHOE AND FO[illegible] DRY CO., has announced the appointm[illegible] of JAMES R. HEWITT as vice president its AMERICAN MANGANESE steel divis[illegible]

CHARLES W. TEST has been appointed d[illegible] trict sales manager in the Philadelp[illegible]

SHOW 'EM YOU ARE CONSERVING!

PLEDGED
CONSTRUCTION EQUIPMENT CONSERVATION

DISPLAY THIS FREE EMBLEM

(Actual size 5" in diameter)

● It's only a red, white and blue sticker but it means a lot to Uncle Sam's war effort because it shows that these operators are conserving their particular construction equipment—making it last longer and work faster, with all the means and experience at their control.

Doesn't make any difference what you run—shovel, bulldozer, tractor, scraper or truck—there's one of these colorful 5" emblems for you. Just send your name and address and say that you want to show others that you are conserving.

Important . . .

Operators of *all types and makes* of equipment are welcome to send for the same red, white and blue emblem. Easy to apply on metal, glass or wood. Nothing to sign except your name and address on a post card addressed to us.

24-Pages of HOW-TO-KEEP-'EM-ON-THE-JOB *Ideas*

Want some practical ideas on how to make quick, emergency repairs; on how to temporarily substitute for critical, hard-to-get parts and materials? Then write for this new Fix-It Handbook. It will help you salvage and conserve worn parts and will save you time and money, too.

THE THEW SHOVEL COMPANY
LORAIN, OHIO

THEW-LORAIN

CRANES • SHOVELS
DRAGLINES • MOTO-CRANES

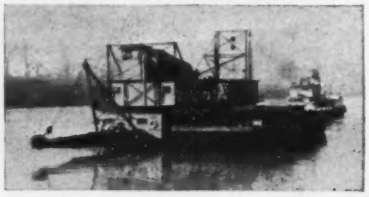
300-Ton Barges of Graded Gravel Loaded in Average Operating Time of 75 Minutes with 10-Inch Amsco Counterflow Pump

T. L. Herbert & Sons of Nashville, Tennessee, in January, 1942 commissioned the dredge "HERBERT" as the latest addition to their river fleet. It is a 10-inch pump size, hydraulic dredge for excavation of sand and gravel, equipped with a rotary cutter ladder, spuds, and a complete screening installation for classifying aggregates. It is powered by a direct-coupled diesel-electric generator set, producing direct current of 230 volts for all units, which are individually operated by electric motors. The hull, super-structure, ladder and rigging frames are all of steel construction. Complete crew quarters are provided. The dredge is not self-propelling, but is moved and attended by a tug.

For production, a 10″ Amsco, Type "H-CF," Form 40 Heavy Duty Dredge Pump is used, "Counterflow" water-seal construction, right-hand top discharge, 12″ suction, having two-direction ball thrust bearing, impeller with threaded bore, and all-welded steel base. It is directly connected to a 150 H.P. motor.

The pump water end parts, including shell, impeller and side plates, all pipe line fittings and the rotary cutter, are Amsco designed and made of impact and abrasion resistant austenitic manganese steel, "The Toughest Steel Known."

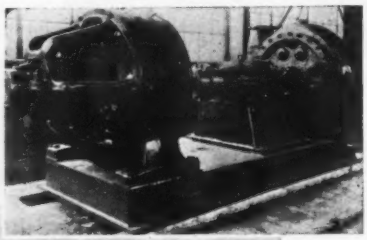
The dredge "HERBERT" is now digging at Johnsonville on the Tennessee River and is loading her 300-ton barges in an average operating time of about 75 minutes. This is graded gravel and does not count the sand excavated, most of which is thrown back. The pump performance rate averages around 30 per cent solids steadily, a tribute to excellent operating management.

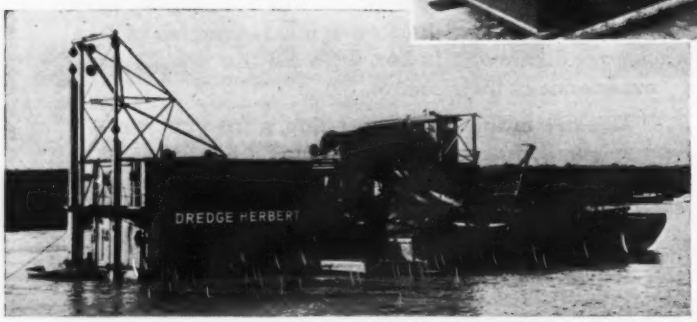


"Dependable and Economical"—words descriptive of Amsco hydraulic dredge equipment, are the usual terms of recommendation from numerous users.

In the gigantic national emergency construction program, hundreds of sand and gravel producers operating Amsco pumps, when called upon for continuous, highest production, have, like T. L. Herbert & Sons, responded in a spectacular manner.

A bulletin is available, completely describing Amsco Dredge Pumps, rotary cutterheads, and pipe line fittings.





Amsco
AMERICAN MANGANESE STEEL DIVISION
Chicago Heights, Illinois
FOUNDRIES AT CHICAGO HEIGHTS, ILL., NEW CASTLE, DEL., DENVER, COLO., OAKLAND, CALIF., LOS ANGELES, CALIF., ST LOUIS, MO.
OFFICES IN PRINCIPAL CITIES

THE AMERICAN
Brake Shoe
AND FOUNDRY COMPANY

district for the YOUNGSTOWN SHEET & TUBE CO. He fills the vacancy caused by the recent death of H. E. Richardson.

EDWARD G. SEUBERT, president of STANDARD OIL CO. OF INDIANA, announced recently that a new and excellent process for the manufacture of neohexane has been developed in Standard's laboratories. Neohexane is one of the combinations of carbon and hydrogen atoms obtainable from petroleum and is used in the manufacture of high octane fuels for the United Nations air forces.

WALTER MOEHLENPAH has been appointed field welding engineer covering Missouri, southern Illinois, western Indiana, southeast Kansas, southeast Nebraska and southwest Iowa for the PROGRESSIVE WELDER CO. of Detroit.

M. C. MORGAN, formerly field service engineer for the A. M. BYERS CO. at Pittsburgh, has been appointed assistant Pittsburgh division sales manager.

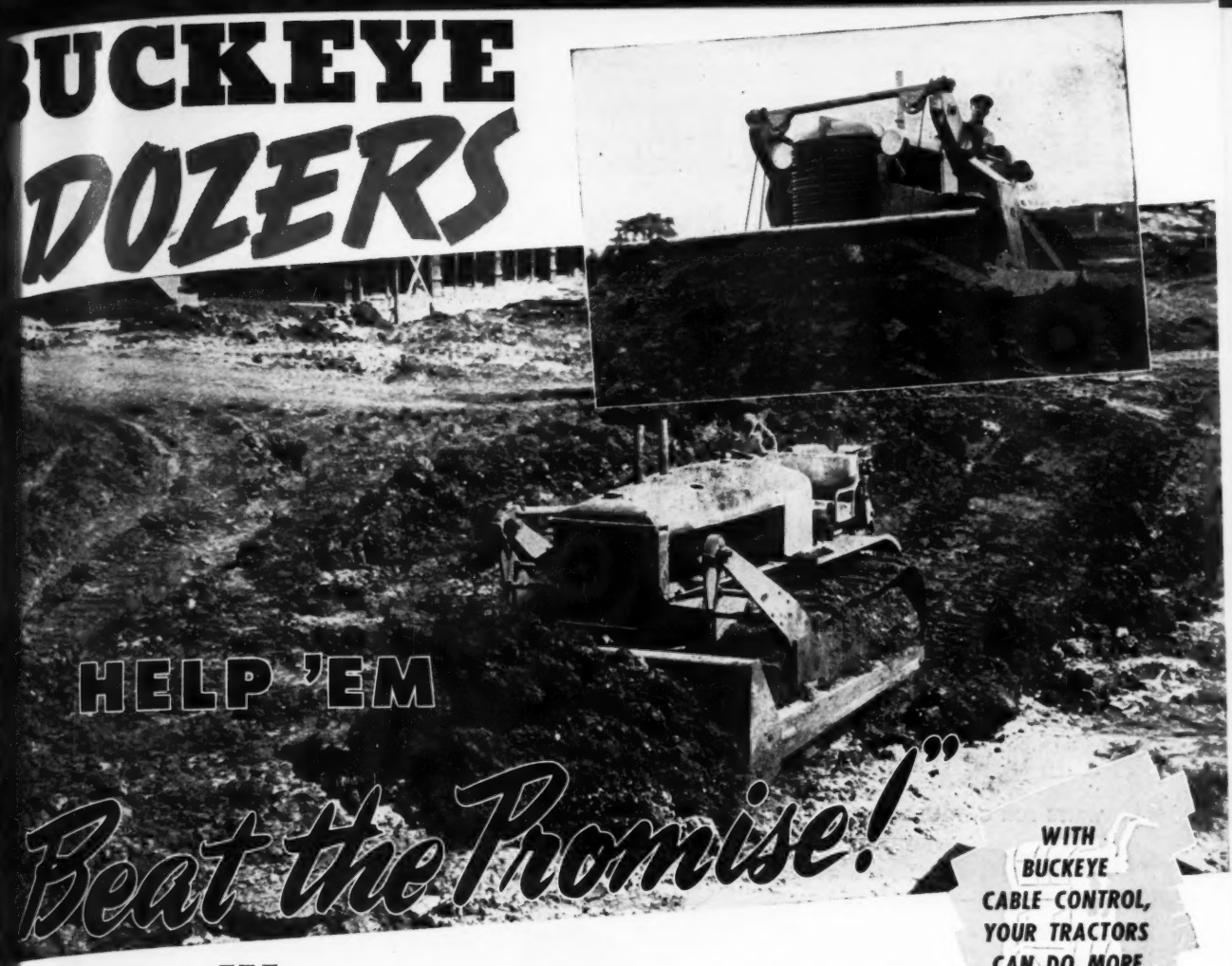
The Army-Navy "E" for excellence in production achievement has been awarded to the Springfield, Ill. plant of the ALLIS-CHALMERS MFG. CO. It is said to be the first such award for tractor production. Don Schweitzer, Springfield works manager, accepted the award on behalf of the company. Speakers at the ceremony included WALTER GEIST, Allis-Chalmers president; W. A. ROBERTS, manager of the tractor division, and Col. JOHN S. SEYBOLD, chief of the Procurement Section, Supply Division Office, Washington, D. C.

The IRVING SUBWAY GRATING CO., INC., of 5007-27th St., Long Island City, N. Y., recently was granted the Army-Navy "E" burgee for "high achievement in production of portable airfield mats." A citation from the services said "The landing mats you manufacture so skillfully are serving as springboards for the launching of the Flying Fortresses and other fighting planes in the Solomons, in Australia, in the British Isles and in the African theaters of war. Not only the mats you manufacture personally but those of other manufacturers made possible by your pioneering."

Presentation of the Army-Navy "E" to the ANTHONY CO., INC., manufacturer of hydraulic hoists and bodies, is hailed as another achievement for a pioneer in this industry.

CHARLES MCKEW PARR, chairman of the board of PARR ELECTRIC CO. and national authority on distribution in the electrical wholesaling industry, has been elected chairman of the recently formed Distributor's War Service Committee.

BUCKEYE DOZERS



HELP 'EM Beat the Promise!"

WITH BUCKEYE CABLE CONTROL, YOUR TRACTORS CAN DO MORE JOBS!

WHERE speed and sustained high output is a *must*, you'll find fast-working Buckeye cable 'dozers hard at work. These output-makers have what it takes to deliver the *most* out of every hour on the job — accurate, lightning-fast cable control; balanced weight that helps, not hinders, tractive effort; scientific blade design to roll bigger-yardage loads and make it easier on the tractor — every practical feature you need in a 'dozer that can help you beat today's hurry-up schedules.

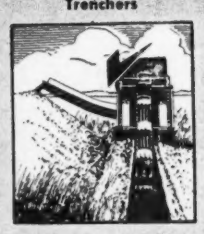
For real help on your tractor equipment problems, see your Buckeye distributor and get the *facts* about Buckeye Bulldozers, Trailbuilders and Power Control Winches.

50 YEARS OF PROGRESS BUCKEYE 1892 1943

THE BUCKEYE TRACTION DITCHER CO.

Built by Buckeye

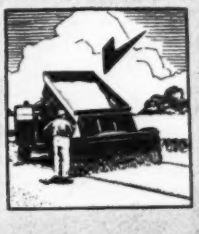
Shovels


Trenchers

Tractor Equipment

R-B Finegraders

Road Wideners


Spreaders

Sauerman LONG RANGE MACHINES

This picture shows how a crane can be used as a power unit to operate a Sauerman Scraper. A 10,000,000-gal. circular reservoir was dug in short order by rigging a 500-ft. slackline cable from the crane boom and suspending a Sauerman bucket from a carrier running on this cable.

Sauerman Slackline Cableway digs bolders and hardpan to clean out a 1-mile tailrace and increase the head for a hydroelectric plant.

Handle Materials at real low cost

On jobs where materials are to be moved distances of several hundred feet or more, a SAUERMAN Drag Scraper or Cableway is a great money-saver because it will pick up, haul and place the materials without the help of other equipment.

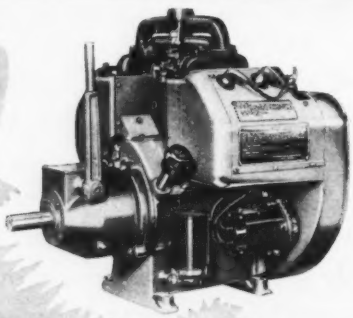
First cost of a SAUERMAN machine is reasonable, maintenance expense is light, and the simplicity of operation permits easy one-man control of even the largest installation.

Moreover this equipment is very flexible and is readily adapted to meet any new and difficult working conditions. Sizes range from small portable units designed for cheap handling of a small hourly tonnage of loose materials up to powerful machines that will move as much as 1,000 tons per hour of the toughest materials.

SAUERMAN BROS., INC.
532 S. Clinton St., Chicago

WRITE FOR CATALOG

WISCONSIN Air-Cooled ENGINES



are in there Pitching for VICTORY!

In the manufacture of Wisconsin Heavy-Duty Air-Cooled Engines miracles of production have been achieved during the past twelve months . . . a volume that would have been considered impossible a year ago. This production, distributed through diversified industrial channels, has been dedicated almost 100% to Victory . . . and will continue to be so dedicated for the duration . . . But we are working earnestly toward that "tomorrow" when industry, as such, can again apply these fine engines to peacetime needs.

MOST POWER Per POUND

WISCONSIN MOTOR Corporation

MILWAUKEE, WISCONSIN, U. S. A.

World's Largest Builders of Heavy-Duty Air-Cooled Engines

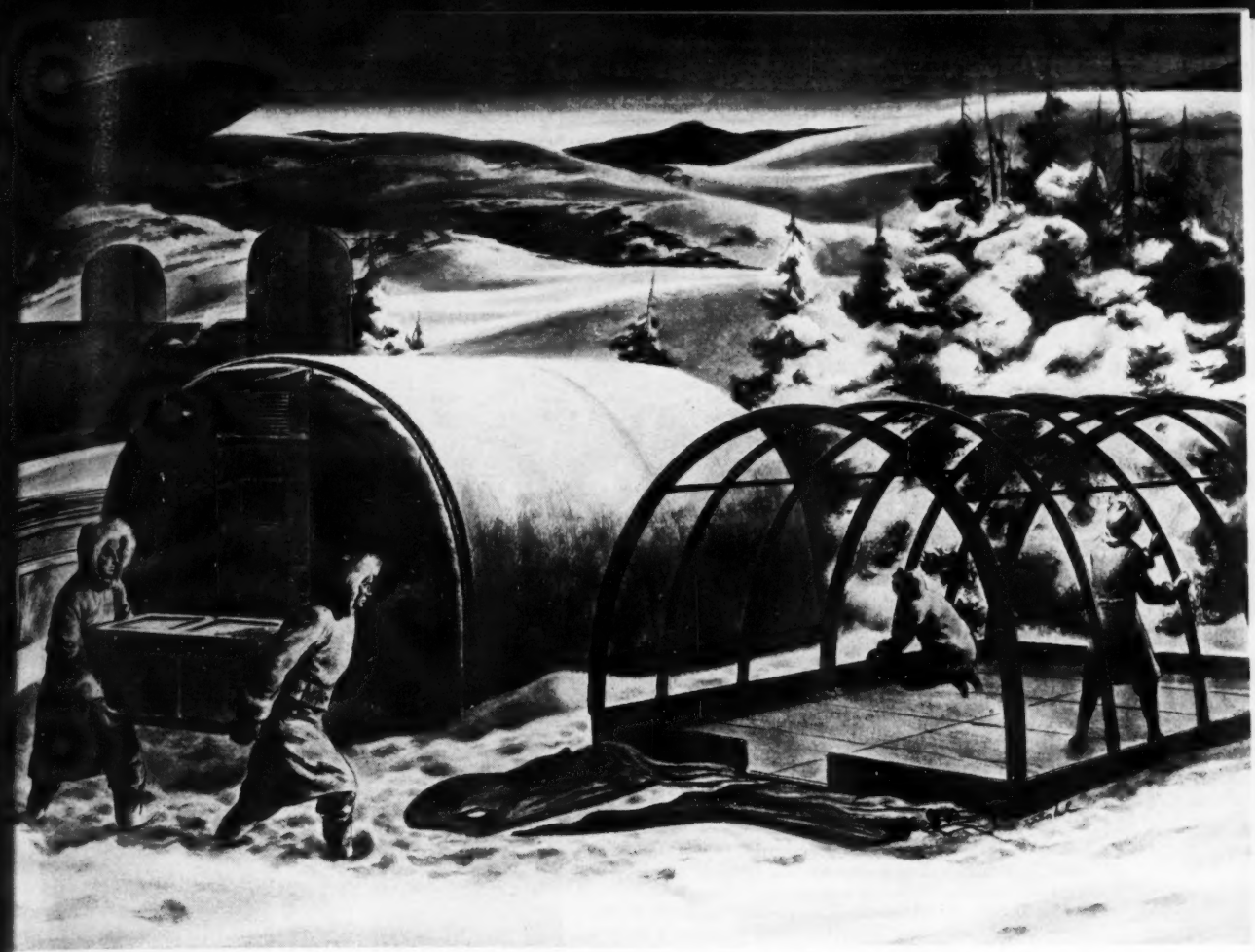
NEW TRADE PUBLICATIONS

Conveying Machinery—A handsome brochure showing the type of handling machinery for coal, ore and other bulk materials is manufactured by the Robins Conveying Belt Co. in Bulletin No. 12 just issued. Containing many illustrations, the brochure shows rope systems; bridges; man-trolley bridges; tower special rigs; grab buckets; car dumpers car hauls and barge hauls, rail clamp cable railways and other products manufactured by the company.—*Robins Conveying Belt Co., Passaic, N. J.*

Water Softeners—The Graver hot process water softener, which conditions water in a way that removes undesirable compounds and elements and permanent hardness, is described in a new folder issued by the Graver Tank & Manufacturing Co. Reaction of heat on water renders such compounds insoluble, so they precipitate and settle out, making it possible to produce a water lower in hardness than is obtainable by the cold process method, according to the manufacturer. Moreover, the reaction of chemicals in water at a temperature of about 180 deg. F. is nearly twice as fast as that of water at a temperature of 60 deg. F. or less. This makes it possible to use smaller quantities of chemicals and considerably reduce the reaction and settling time. The booklet, well illustrated with charts and photographs, undertakes to explain in detail the exact workings of the machine.—*Graver Tank & Manufacturing Co., Inc., East Chicago, Ind.*

Birthday—Celebrating its 100th birthday, the firm of Joseph T. Ryerson & Son, Inc., has commemorated the occasion by publishing a brochure "100 Years of Peace and War." Ben Stahl, illustrator for the Saturday Evening Post, handles the principal drawings which dramatize the events in the history of Ryerson and the nation. The text is handled in an easy, fast moving style. The story unfolds with reference to the early pioneer Ryerson family that first built and operated iron forges in New Jersey at the time of the Revolutionary War.—*Joseph T. Ryerson & Son, Inc., Chicago, Ill.*

Zinc—Another in a series of folders designed to inform customers of the war



THESE ARE THE NEW ARCTIC SHELTERS *for the Army Air Forces; the one at the left is up and in use; the other at the right is being erected. These shelters are so light and compact that they can be flown in large numbers to advanced bases where strategy demands airplane maintenance in this global war.*

For keeping fingers nimble . . .

IN THE ARCTIC, where the temperature often hits 65 degrees below, with howling snow storms the rule and not the exception, it's mighty tough to repair an airplane engine.

It's tough to keep fingers nimble for working on parts and it's equally tough on the engine itself.

Yet, the Army Air Forces are meeting this problem with portable shelters—a vast number of them. You see two pictured above.

These ingenious structures have semicircular ribs of laminated wood. These ribs are covered with heavy fabric mattresses; two for the roof and sidewalls and one each for the front and back.

These mattresses are lined with Fiberglas,* an unusually light yet efficient insulating material made of glass in fibrous form.

The lightweight Fiberglas gives these shelters a number of advantages. They can be carried in large numbers by cargo planes. They are compact when knocked down and save shipping space. They are so easy to handle that they can be put up in an hour and taken down in even less time.

And because of its high insulating value, Fiberglas saves about 20,000 pounds of fuel per season over what would be needed to heat an uninsulated shelter. This provides an additional saving of shipping space to transport other supplies.

In addition, these shelters are engineered to stand up to most arctic gales; so cleverly built that, if bigger working or living space is needed, two or more shelters can be put end to end. In every part, they are highly resistant to fire, moisture, and rot.

In designing and producing these ingenious structures, full credit goes to Army Air Forces technicians . . . also to the company ① of farm-building and equipment engineers now devoting its major efforts to war production.

Many wartime uses of Fiberglas like this one prevent us from supplying as much of this material as is desired to insulate houses and aid in the fuel-saving program on the home front.

But we're mighty proud that both the Army and the Navy are finding Fiberglas so valuable to them.

To meet these needs our production is being constantly expanded. We are determined to let nothing stand in the way of supplying enough Fiberglas for vital wartime uses, where Fiberglas is the only suitable material for the job to be done. *Owens-Corning Fiberglas Corporation, Toledo, Ohio. In Canada, Fiberglas Canada, Ltd., Oshawa, Ontario.*

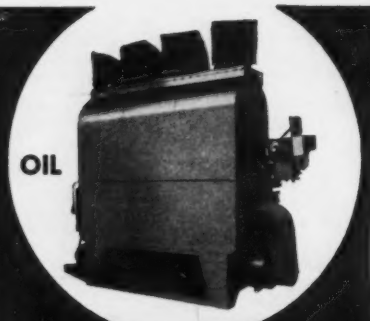
ARMY (E) NAVY

① Name supplied on request.

OWENS-CORNING

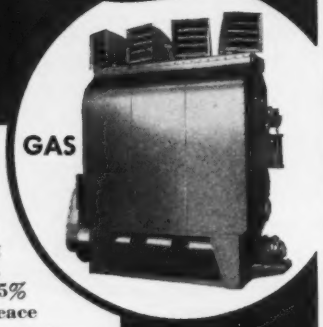
FIBERGLAS

*T. M. Reg. U. S. Pat. Off.



DRAVO DIRECT FIRED HEATERS

. . . SAVE TRANSPORTATION & CRITICAL MATERIALS



● By actual comparison, made for the information of men responsible for allocating vital materials—heating systems of Dravo self-fired units use less metal* in the making and fewer man-hours in installing than heating plants of conventional design.

In operation, fuel requirements are 20 to 25% lower — a desirable cash economy in peace time, but important today as a means of conserving fuel and its transportation.

The Direct-Fired method of producing heat is not new—Dravo sold and installed such systems a decade ago. Today production and sales are soaring because of the demands of the War Program—but orders for quick delivery of standard sizes for essential plants can still be taken.

Architects, consultants, heating engineers, plant owners, purchasing agents,—anyone with an interest in the heating problem of a war plant—write or wire for description of the line of DRAVO HEATERS. Our engineering department will submit detailed recommendations, prices, weights, estimated fuel consumption, and delivery schedules for comparison with similar data on any other heating system you may have under consideration.

DRAVO CORPORATION
HEATER DEPARTMENT
DRAVO BUILDING PITTSBURGH, PA.
Sales Offices in Principal Cities

*WHY DRAVO HEATERS HAVE EARNED HIGHEST PRIORITY

● Just off the press, 12 page booklet showing the savings in critical materials made possible through the use of Dravo Heaters. Copy on request.

DRILLING
ANYWHERE

We look into the earth

PENNSYLVANIA
DRILLING COMPANY
PITTSBURGH, PA.

Hayward Buckets

Use this Class "E" Clam Shell Bucket for handling crushed stone, gravel, sand and other bulk materials.
THE HAYWARD CO., 48-50 Church St., N. Y.

time status of zinc has been issued by the New Jersey Zinc Co. This issue tells the story of the men and equipment behind the wartime production of zinc.—*New Jersey Zinc Co.*, 160 *Front St., New York, N. Y.*

Control Instruments—Wheelco Instrument Co. has issued five new bulletins describing its complete line of industrial indicating, recording and control thermometers. Bulletin G23-2, 12 pages, discusses the operating principles of Wheelco thermometers; Bulletin G503-2 covers the company's recording control thermometer, while G603-2 is on the Wheelco indicating control thermometer. Bulletin G303-2 describes and gives applications for the company's indicating thermometer, while Bulletin G403-2 covers its recording thermometer.—*Wheelco Instrument Co., Harrison & Peoria St., Chicago, Ill.*

Fuel Conservation—A 16-page manual "Selecting Controls for Fuel Conservation," has been prepared by the Hotstream Heater Co. The booklet explains in everyday terms the fundamental rules and formulae that govern the proper burning of fuel and the utilization of heat so created; and offers suggestions for selection of equipment with which the most efficient use of fuel can be obtained. The manual is divided into five major divisions, the first concerned with natural draft coal burning; the second automatic stoker firing; the third chain grate and spreader stoker operation; the fourth forced draft hand firing, and the fifth takes up natural draft oil burning. Each type of installation is illustrated by drawings and photographs.—*The Hotstream Heater Co., Combustion Equipment Division*, 8007 *Grand Ave., Cleveland, Ohio.*

Handling Equipment—An 18 page section of a new industrial handling equipment catalog has been released by H. L. Pitcher Co., sales agent for the Rose Mfg. Co. The booklet contains the most popular models of factory trucks and trailers, both all steel and wood platform numbers. End, side and three-way entrance dumps are included. A four page insert is devoted to heavy duty all steel caster specifications, diagrams and illustrations. The catalog is of the semi-looseleaf type so that pages can be taken out or inserted as required.—*H. L. Pitcher Co.*, 12400 *Strathmoor, Detroit, Mich.*

Lubrication Chart—A poster size lubrication chart designed to help earthmovers care for their equipment and make it last longer, has been released by the R. G. LeTourneau, Inc. The chart is a quick reference on the complete LeTourneau line of power controlled units, carryall scrapers, dozers, rooters, cranes, sheeps-

FREE to Engineers Architects Designers

Wood Goes to War In 1000 Forms

By billions of board feet, and in more than 1000 different forms, lumber is streaming to the Army, to the Navy, to the Maritime Commission. This book of pictures — 48 pages, 200 illustrations — tells the amazing story of how Wood, on every front, is contributing to Allied victory.

You will see great war plants, shipyards, hangars, bridges — all built of timber . . . for today's structural engineers, using radically new methods, are working new wonders in timber construction. You will learn why and how these engineers use TECO RINGS — the modern connectors that so multiply the strength of timber joints and timber trusses that timber has been transformed, within a few years, from a simple carpentry material into a full-fledged, heavy engineering material.

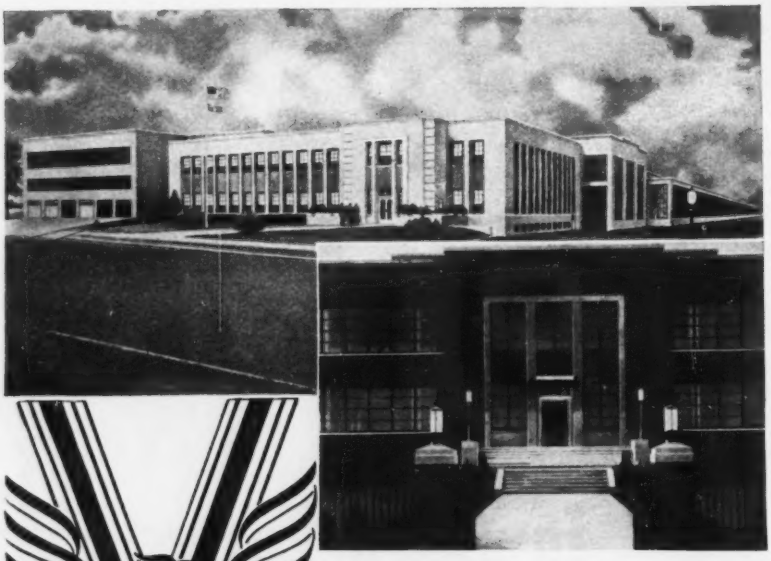
The TECO Ring Connector spreads the load on a timber joint over practically the entire cross-section of the wood.

Timber ENGINEERING COMPANY
WASHINGTON, D. C. PORTLAND, OREGON

Mail This Coupon TODAY

TIMBER ENGINEERING CO.,
1319 18th St., N. W., Washington, D. C.
Please send me a FREE copy of your illustrated book, "The Forest Fights."

Name .....
Firm ..... State .....
Address .....



VITAL NEW MACHINE TOOL PLANTS PROTECTED BY Carey BUILT-UP ROOFS

At many of the nation's great machine tool plants, as on every other industrial front, CAREY Built-Up Roofs are rendering outstanding service by protecting buildings and equipment vital to the war program—worthy testimony to the DEPENDABILITY of these famous engineered roofs.

CAREY Roofs are individually designed to withstand temperature extremes, salt air, chemical fumes, and other conditions that adversely affect roof life. Normally, these time-tested roofs far outlive their bonded period of service. Make sure of maximum roof VALUE at minimum cost—specify CAREY. A nationwide organization of experienced roofing contractors is at your call. For details, address Dept. 30.

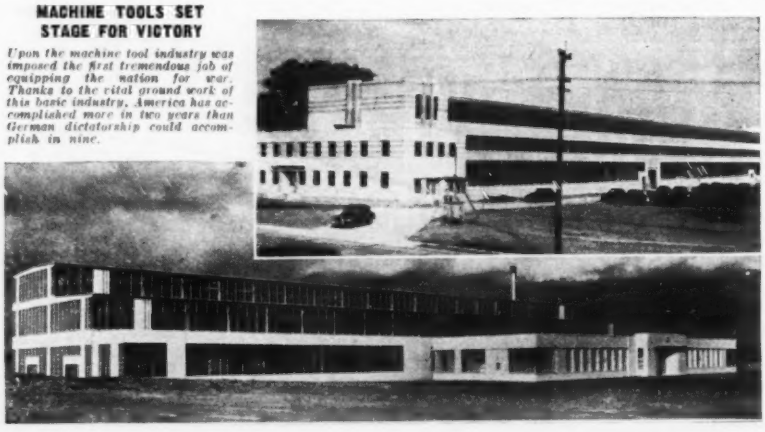
THE PHILIP CAREY MFG. COMPANY

Dependable Products Since 1873 — LOCKLAND, CINCINNATI, OHIO

In Canada: The Philip Carey Co., Ltd. • *Office and Factory:* Lennoxville, P. Q.

MACHINE TOOLS SET STAGE FOR VICTORY

Upon the machine tool industry was imposed the first tremendous job of equipping the nation for war. Thanks to the vital ground work of this basic industry, America has accomplished more in two years than German dictatorship could accomplish in nine.



foot rollers and other types. The 16 in. by 20 in. chart is boldly designed in big readable type especially for mounting on construction shack or maintenance shop walls. It graphically tells and shows what points are to be lubricated at what intervals, and recommends proper lubricants and grease to be used.—*R. G. Le Tourneau, Inc., Peoria, Ill.*

Manganese Steel—A catalog designed to answer a few of the many questions on manganese steel has been issued by the American Manganese Steel Division of the American Brake Shoe & Foundry Co. Divided into sections covering the use of this toughest steel known in the blast furnace department, the coke plant, the rolling mill and foundry, the booklet also offers a proved method for successfully reclaiming spindles, crabs and coupling boxes by employing Amsco V-Mang build-up welding rod followed by application of Amsco Hardface welding rod.—*American Brake Shoe & Foundry Co., Chicago Heights, Ill.*

Wiring—The Wiremold Co. has announced publication of a new bulletin describing and illustrating industrial application of Wiremold No. 3000 System Wiring, used as a branch circuit feeder raceway for plant power and lighting circuits, and featuring use of industrial type receptacles, use of Wiremold fittings for branch circuit connections, and methods of spanning beams in industrial buildings. This bulletin also covers application and installation of Plugmold, convenient outlet systems for bench, work table, test rack and plant office service.—*The Wiremold Co., Hartford, Conn.*

Vibro-Insulators—As a valuable addition to its catalog section on Vibro-Insulators, just revised and reprinted, the B. F. Goodrich Co. has published an engineering work sheet on the subject. The company explains that in order to attack a problem requiring Vibro-Insulators, devices of rubber and metal, every factor regarding location of equipment, motivating power, frequency of vibration and other questions must be known. The new work sheet is an aid in compiling that data. When filled out by an engineer or plant superintendent, the sheet gives the company all the information needed to recommend the proper type of Vibro-Insulator.—*The B. F. Goodrich Co., Akron, Ohio.*

Conveyor—An 8 page brochure, titled "Winning the Battles of Production" describing many applications of conveyors in the war production economy has been issued by the Alvey Conveyor Mfg. Co.—*Alvey Conveyor Mfg. Co., Broadway, Wyoming and 7th Sts., St. Louis, Mo.*

WOULD *You* HALF-RATION OUR FIGHTERS?

This pile, big as it is, contains *only half enough* scrap to run Youngstown's open hearth furnaces *one day.*

Imagine a pile 20 times this big and you know how much scrap it takes each 12-hour turn to keep all the steel mills going.

Each time this pile goes, another must be ready to take its place—twice a day, every day, until the war is won.

It's the dormant scrap you make available that will keep the nation's scrap pile up. If you slow down or stop your effort to find it and turn it in—if the mills have to do with one pile a day instead of two—then YOU must share the hazard of putting the boys in uniform on half-rations of steel!

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Youngstown, Ohio

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THROW YOUR SCRAP INTO THE FIGHT
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LOW BED-
-HEAVY DUTY
TRAILERS

ROGERS BROTHERS CORP., ALBION, PENNA.

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Foundation Testing for Bridges, Dams and All Heavy Structures

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OHIO
LOCOMOTIVE CRANES
15 to 50 TONS CAPACITY
DIESEL • ELECTRIC • GASOLINE • STEAM
The OHIO LOCOMOTIVE CRANE CO.
BUCYRUS . . . OHIO

MEN AND JOBS

W. Prescott Foster, director of the Louisiana State Highway Department, has resigned to accept an appointment to the highway board. State Senator **D. Y. Smith** succeeds Mr. Foster as director of the highway department.

A. F. Morrell, USNR, construction assistant at a Navy construction project in North Carolina, has been promoted to the rank of lieutenant (jg).

W. G. Pruett, former head of the Alabama highway department, has been appointed office engineer for the state.

Erroll Bacot, for two years city engineer at Conway, S. C., and **Donald Graham,** Conway engineer, have volunteered for Army service.

John Naughton, former WPA administrator for Iowa, has been appointed superintendent of construction and local manager of construction for the Kuchan & Union Construction Co. of Des Moines, Iowa, contractors on a large defense housing project at Fort Worth, Texas.

James W. McLaughlin, civil engineer of Fort Lauderdale, Fla., has joined the naval construction battalion as a warrant officer.

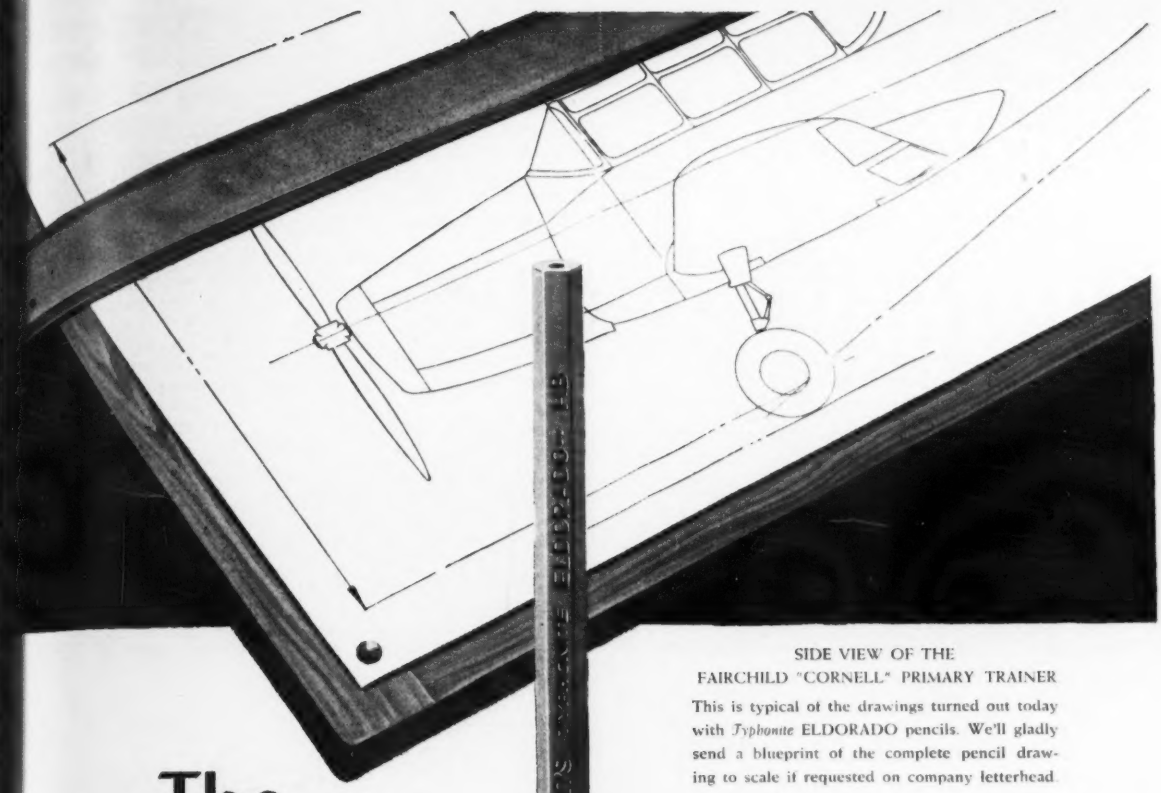
Capt. O. C. Helseth of Minneapolis, Minn., area engineer on a project near Helena, Mont., has been transferred to Kansas City, Mo.

Wesley W. Gutteridge of Hackensack, N. J., has been appointed superintendent of the Spring Valley Water Works & Supply Co., a subsidiary of the Hackensack Water Co., succeeding the late Courtland M. Mosier. Mr. Gutteridge has been a member of the engineering staff of the Hackensack Water Co. since 1937.

Rudolph Jones, Jackson, Tenn., division engineer for the Tennessee Highway Department, has been commissioned a lieutenant in the U. S. Naval Reserve, stationed at Norfolk, Va.

Edward E. Minor, vice president of the New Haven, Conn. Water Co., has been appointed associate water coordinator of the Connecticut Defense Council, succeeding **G. E. Lourie,** superintendent of the Bristol water department.

John C. Geyer has become assistant chief engineer of the health and sanitation division of the Inter-American Institute, now engaged on sanitation projects in Latin America. He has been granted a



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FAIRCHILD "CORNELL" PRIMARY TRAINER

This is typical of the drawings turned out today with *Typhonite* ELDORADO pencils. We'll gladly send a blueprint of the complete pencil drawing to scale if requested on company letterhead.

The Mighty Pencil

The man behind the ELDORADO is a threat to the Axis. His lead is proving as deadly as the kind used by the man behind the gun. His job is that of creating the blueprints of destruction to destroy said Axis.

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Never underestimate the value of *Typhonite* ELDORADO pencils in America's drafting rooms. They're doing magnificent work! Drawings made with *Typhonite* ELDORADO leads insure clean, easy-to-read blueprints . . . *in less time.* There's no time out for inking in . . . the density and accuracy of ELDORADO'S leads guarantee blueprinted whites sharp — readable.

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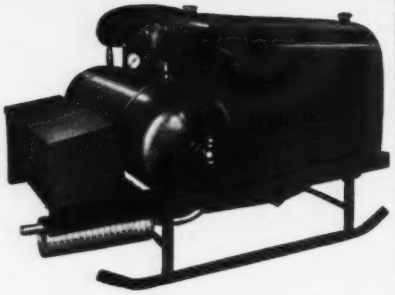
Save
time and money
with this new
VICTORY
MODEL SMITH AIR COMPRESSOR
(less critical material than any other standard compressor)

SMITH AIR COMPRESSORS



You know how vital SPEED is now. But, have you thought how you can speed-up your compressor operations with lightweight, flexible Smiths? Did you know that large, cumbersome compressors may be replaced on a majority of compressor operations?

60 cu. ft. size (illustrated above) uses only 1 gal. of gasoline an hour. Made with FORD MOTORS and standard parts, the ruggedness and efficiency of these famous compressors are sources of constant satisfaction to users everywhere. Wire, phone or write today for complete information!

With a Ford Motor and shop facilities you can assemble your own Smith Compressor. We will furnish a Smith Compressor Head and Accessories with complete instructions for mounting.

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GORDON SMITH & CO.
INCORPORATED
430 College St. Bowling Green, Ky.

leave of absence from Johns Hopkins University, where he has been serving as associate in sanitary engineering.

L. D. Howard, manager of the Statewide Highway Planning Survey in South Dakota, has been granted a leave of absence to accept a commission as a first lieutenant in the Corps of Engineers. He is succeeded by **R. K. McMillan,** statistician for the survey.

C. E. Keefer, associate engineer, bureau of sewers, Baltimore, Md., has been appointed a special lecturer on sanitary engineering at the Johns Hopkins University.

Lieut. G. W. Burbridge, of the Royal Canadian Engineers and a former civil engineer of Quebec, Canada, has been promoted to the rank of captain.

Lewis A. Lush, city engineer at Springfield, Ill., has been appointed commissioner of streets and public improvements, succeeding the late Percy I. Darling.

Frank Mitchell, right-of-way agent for the South Dakota State Highway Commission, has been appointed secretary of the commission, replacing **H. C. Westphal** who resigned recently.

John Schofield, chief architect of the Canadian National Railways and the Trans-Canada Air Lines, has been named construction controller in the Department of Munitions and Supply at Ottawa, Canada. He succeeds **C. B. Jackson** of Toronto who resigned recently.

James Deneen, formerly of St. Paul, Minn., and recently an engineer on an ordnance plant waterwoks project in Minnesota, has been appointed city engineer at Crookston, Minn., succeeding the late J. E. Dishington.

E. L. Dudley, district sanitary engineer at Morehead City, N. C., for the past two and a half years, has been commissioned a first lieutenant in the Corps of Engineers and has been ordered to report to South America to supervise water and sewage disposal operations there.

Maj. C. W. Hamilton, Fort Benning, Ga., area engineer, has been transferred to the post of regional deputy director of post engineers, with headquarters in Montgomery, Ala.

Lieut. N. A. Bray of New Bern, N. C., has been assigned as operations officer for the area engineer at Camp Butner, N. C.

Byron Jones, a draftsman for the South Dakota State Highway Commission, has

KEEP YOUR CONVEYOR BELTS GOING

FLEXCO H D RIP PLATES are used in repairing rips and patching conveyor belts. Their use saves expensive replacements and extended shutdowns.

FLEXCO H D BELT FASTENERS make a strong, tight butt joint with long life. Recessed plates embed in belt, compress belt ends and prevent ply separation. Six sizes in steel and alloys.

● Avoid shutdowns and lengthen the life of your conveyor belts and buckets elevator belts by using Flexco belt fasteners. Thousands of companies have stepped up the performance of conveyor lines and cut costs by using Flexco methods.

Bulletin F-100 shows exactly how to make tight butt joints in conveyor belts with Flexco. Also illustrates step by step the latest practice in repairing rips and putting in patches.

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FLEXCO H D BELT FASTENERS
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"GUNITE" is of particular value in metal and coal mines, for treating side walls and roofs and for protecting mine timbers and steel framing.

Our Bulletin 2200 describes and illustrates many cases of mine work as well as scores of other uses of "GUNITE"—available to mining engineers.

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LET US BID ON YOUR WORK

WHERE SPEED IS ESSENTIAL

Specify WOOLDRIDGE SCRAPERS

In the construction of airports, landing fields, advance bases, etc., *time* is just as important a factor as in actual military operations. Delays often prove extremely costly. In leveling and filling of uneven ground, speed, therefore, is a prime prerequisite for heavy duty earthmoving equipment. Backed by a world of job-proven performance, Wooldridge Scrapers have been noted for their speed in handling larger heaping loads in less time, at a lower yardage cost. This is because Wooldridge Scrapers load faster, and dump faster with less cable wear—less down-time for repair, over longer periods of constant use. Therefore, when you buy, always specify Wooldridge Scrapers.

WOOLDRIDGE SCRAPERS ARE AVAILABLE IN SIZES RANGING FROM 9 TO 30 CU. YARD CAPACITIES. WOOLDRIDGE SCRAPERS ARE SUPPLIED TO THE UNITED STATES GOVERNMENT FOR TWO LINE OPERATION, PERMITTING TWO DRUM POWER UNITS TO BE USED. WOOLDRIDGE SCRAPERS OPERATE ON THE PIVOT-TILT FORCED LOAD EJECTION PRINCIPLE.

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SPLIT PROPELLER POWER TAKE-OFF

Today it is essential that every available truck be utilized 24 hours a day 7 days a week. Speed is vital to our War construction program. Here is a suggestion on how to make your present trucks do more work without impairing their present duties.

This compact unit makes available existing power by merely installing the Davey Split Propeller Power Take-Off. This power may be utilized for various uses—to drive an air compressor—an electric generator set—an electric welder and in many other ways to speed up construction work of all kinds.

Keep your truck power busy constantly with a Davey Split Propeller Power Take-Off and thus do more work with less equipment.

This unit is adaptable to new or old trucks.

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Davey also builds a full line of heavy duty portable and industrial compressors, pneumatic saws and pole hole diggers.

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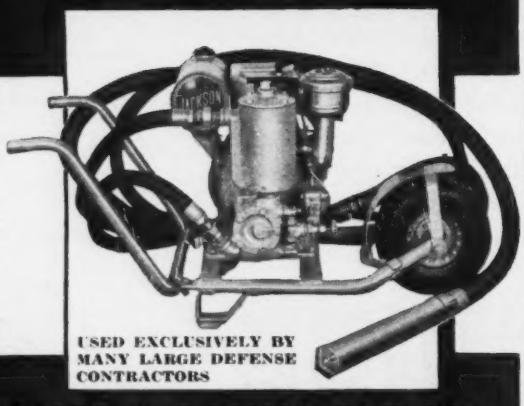
DESIGNED TO "TAKE IT" 3 SHIFTS A DAY—EVERY DAY

- Automatic pressure lubrication—requires no attention.
- 34-ft. hose—2¾" vibrator head.
- Adjustable frequency to 6800 R.P.M.—submerged in concrete.
- Powerful gas engine—4.7 H.P.
- Long-lived, ball-bearing, rotary, hydraulic pump.



USED EXCLUSIVELY BY MANY LARGE DEFENSE CONTRACTORS

ELECTRIC TAMPER & EQUIPMENT CO.
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resigned to accept a post with the Stanley Engineering Co., Muscatine, Iowa.

Lieut. H. T. Suedkamp, USNR, has been named Navy construction officer at Cherry Point, N. C.

Roy Biberstine has resigned as highway commission district engineer at Fort Wayne, Ind., to become postmaster at Bluffton. He will be succeeded by **George H. Lutz,** district engineer of maintenance at Fort Wayne.

Raymond D. Gangwer has been appointed waterworks superintendent at LaPorte, Ind.

Alfred Kaufman, city engineer of Rensselaer, N. Y., has been named chairman of the city's newly created planning commission.

Robert A. Hurley, first commissioner of public works in Connecticut and once governor of that state, has been elected vice president of the Narragansett Machine Co. of Pawtucket, R. I.

Paul Beique, civil engineer of Montreal, Que., Canada, has been elected president of the Montreal Chamber of Commerce.

L. E. Whitfield, of Asheboro, N. C., Sixth Division engineer for the North Carolina Highway and Public Works Commission, has been elected chairman of the Asheboro Planning Commission. **Walter E. Yow,** Asheboro city manager, was made secretary of the organization.

A. W. Herrington, chairman of the board of directors of the Marmon-Herrington Co., has been elected a director of the Army Ordnance Association.

J. P. McGuire, of Durham, N. C., head of the general contracting firm of J. P. McGuire Construction Co., has been commissioned a captain in the Corps of Engineers and made assistant to the division engineer at Atlanta, Ga.

Lee Bardwell Brandon, who for 14 years has been county engineer for Lauderdale County, Miss., has reported for service as a first lieutenant in the Coast Artillery. He is stationed at Santa Barbara, Cal.

Maj. James W. Dement, Jr., has been appointed chief of the newly created Southwest Special Procurement Division of the Corps of Engineers, with offices in Dallas, Tex. He was formerly stationed in Mobile, Ala., where he supervised procurement for a large territory.

Maj. Joseph K. Carson, former mayor of Portland, has been assigned to the school of military government at Char-

Make Haste without Waste with MONOTUBES

... the job-proven method of installing foundations faster, safer, and at less cost

The use of all-steel tapered Monotubes is a proven, practical method of installing cast-in-place concrete piles that meets all engineering requirements while assuring you important economies.

Consider these special Monotube features:

1 ***SPEEDY Handling***—Monotube steel casings are light in weight for fast and economical handling.

2 ***SPEEDY Driving***—Monotubes are so strong and rigid they require no heavy core or mandrel and can be driven with average job equipment.

3 ***SPEEDY Extension***—The use of extendible Monotubes permits installation of varying pile lengths without delay or waste—even in low headroom.

4 ***SPEEDY Inspection***—The hollow tubular design of Monotubes enables you to inspect these casings quickly and thoroughly from top to toe prior to concreting.

Monotubes, made only by Union Metal, are available in a wide range of gauges, sizes, and tapers to meet the most exacting requirements in any soil condition. Write for your copy of the Monotube Catalog 68A which gives additional valuable information.

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MORE HAULING IN '43

MORE MILEAGE with GMC Service

In a survey of 741 factories producing war materials, 65% of war freight received and 69% of that shipped out was carried by motor truck. This year, America's trucks will be busier then ever before serving the war plants that produce weapons, munitions and supplies for our soldiers and allies. Everyone must co-operate to keep these trucks operating as dependably as possible for as long as possible. GMC dealers are pledged to do their part. And GMC Preventive Maintenance has proved its ability time and again to make trucks run better, longer.

Special "Service Payment Plan" available through our own YMAC

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GMC VICTORY MAINTENANCE KEEPS YOUR TRUCK ON THE JOB

THE TRUCK OF VALUE

GMC TRUCKS

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lottesville, Va. Major Carson, who was a captain in the first World War, has been acting as public relations officer for the U. S. district engineer office at Portland.

John Charles Hokway, formerly of the U. S. Engineer district office at Wright Field, Dayton, Ohio, has been called to active service as a lieutenant, senior grade, in the Navy's Civil Engineer Corps.

Ernest C. Willard, civil engineer of Portland, Ore., has been reelected vice president of the city planning commission.

Dr. Herman G. Baity, professor of sanitary engineering at the University of North Carolina at Chapel Hill, will leave soon for Brazil to become assistant to the Sanitary Engineer of the Brazilian government, working under the direction of the Office of the Coordinator for Inter-American Affairs. **Dr. Brewster Snow,** formerly of Duke and Harvard universities, will take over Dr. Baity's duties.

Samuel W. Waddle, formerly an engineer for the Pacific Telephone & Telegraph Co. at Portland, Ore., has been promoted to the rank of lieutenant-colonel, according to an announcement from the Alaska Defense Command.

W. D. Wiggins, chief engineer of the Pennsylvania Railroad, has been promoted to vice president. **J. L. Gressitt,** assistant chief engineer has been named chief engineer.

T. J. Tobiassen, of Southport, N. C., has been promoted to the rank of major in the Army Air Forces at Wright Field, Ohio. Major Tobiassen was formerly head of supply and contract section of the U. S. Engineer Office at Wilmington, N. C.

Chief engineer **H. R. Clarke** of the Burlington Railroad recently announced a number of engineering promotions. They are: **G. A. Haggander,** assistant chief engineer, lines east, becomes assistant chief engineer, system; **G. W. Gallier,** assistant engineer, becomes assistant chief engineer, lines east; **C. W. Breed,** office engineer, becomes engineer of standards; **E. J. Brown,** assistant superintendent at Galesburg, Ill., becomes engineer of track, system.

George M. Fowler, design engineer, and **Harry C. Davidson,** chief surveyor for the Widmer Engineering Co. of St. Louis, Mo., have been transferred to Oklahoma to design and supervise construction of a large-scale housing project.

M. H. Furbringer, architect, has become

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ctual use is always "the proof of the pudding" . . . es, in practically every field, under practically every ondition, for years and years and years, genuine Hot ip Galvanizing has demonstrated that it gives you *ore* rust protection for *less* money . . . Your main-enance men know that this is true and your labora-tory men know why it is inevitable . . . be sure that you get *genuine* Hot Dip Galvanizing by dealing with the qualified Association members listed below . . . Let us send you the complete story; write to American Hot Dip Galvanizers Association, Inc., First National Bank Building, Pittsburgh, Penna.

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cme Galvanizing, Inc., Milwaukee, Wis. ★ Acme Steel & Malleable Iron Works, Buffalo, N.Y. ★ American Tinning Galvanizing Co., Erie, Pa. ★ Atlantic Stamping Co., Rochester, N.Y. ★ Atlantic Steel Co., Atlanta, Ga. ★ uffalo Galvanizing & Tinning Works, Inc., Buffalo, N.Y. ★ Columbian Steel Tank Co., Kansas City, Mo. ★ Com-mercial Metals Treating, Inc., Toledo, Ohio ★ Diamond Expansion Bolt Co., Inc., Garwood, N.J. ★ Emsco errick & Equipment Co., Los Angeles, Cal. ★ Equipment Steel Products Division of Union Asbestos and Rubber o., Blue Island, Ill. ★ The Fanner Mfg. Co., Cleveland, O. ★ John Finn Metal Works, San Francisco, Cal. ★ Galvan-ers, Portland, Oregon ★ Thomas Gregory Galvanizing Works, Maspeth, N.Y. ★ Hanlon-Gregory Galvanizing Co., ittsburgh, Pa. ★ James Hill Mfg. Co., Providence, R.I. ★ Hubbard & Co., Oakland, Cal. ★ Independent Galvaniz-ng Company, Newark, N.J. ★ International-Stacey Corp., Columbus, O. ★ Isaacson Iron Works, Seattle, Wash. ★ oslyn Co. of California, Los Angeles, Cal. ★ Joslyn Mfg. & Supply Co., Chicago, Ill. ★ L. O. Koven & Brother, Inc., ersey City, N. J. ★ The Thomas Laughlin Co., Portland, Maine ★ Lehigh Structural Steel Co., Allentown, Pa. ★ Lewis olt & Nut Co., Minneapolis, Minn. ★ Los Angeles Galvanizing Co., Huntington Park, Cal. ★ Missouri Rolling Mill Corp., St. Louis, Mo. ★ The National Telephone Supply Co., Cleveland, O. ★ Oliver Iron & Steel Corporation, ittsburgh, Pa. ★ Penn Galvanizing Co., Philadelphia, Pa. ★ Riverside Foundry & Galvanizing Co., Kalamazoo, ich. ★ San Francisco Galvanizing Works, San Francisco, Cal. ★ The Sanitary Tinning Co., Cleveland, O. ★ Southern Galvanizing Company, Baltimore, Md. ★ Standard Galvanizing Co., Chicago, Ill. ★ Wilcox, rittenden & Company, Inc., Middletown, Conn. ★ The Witt Cornice Company, Cincinnati, Ohio

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Only the best quality tracing cloth is smooth enough to take erasures without smudging . . . strong enough to stand up to the corrections constantly being made today. Only the best quality tracing cloth is transparent enough to insure the sharpness of transfer that war drawings must have to be read easily, quickly, and accurately. That's why it's important, during these critical years, to use the best tracing cloth money can buy . . . ARKWRIGHT. Arkwright Finishing Company, Providence, Rhode Island.

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Wood Preservers Since 1878

All kinds of Structural Timbers and Lumber Pressure Treated with Creosote Oil or

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POLES, CROSS ARMS, PILING, TIES POSTS, BRIDGE AND DOCK TIMBERS

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MITCO

OPEN STEEL FLOORING

Pressure Formed
90% Open Area

Easy to Install

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chairman of the Memphis, Tenn., ... planning commission.

Lieut. Lester W. Bray, of New Be... N. C., formerly with the army constr... tion forces at Camp Davis, N. C., ... been assigned as operations officer ... the area engineer at Camp Butner.

Charles B. Gramling has been appoint... chief engineer of waterworks pump... stations for Atlanta, Ga.

C. K. Carter, Jr., of Greensboro, N. ... trainmaster for the North Carolina li... a subdivision of the Danville division ... the Southern Railway, has been tra... ferred to Macon, Ga. as superintende... of the Georgia Southern and Flori... Railway. Mr. Carter has been co... nected with the Southern Railway sin... 1925, when he joined the engineeri... division.

W. G. Pruett, who has been Alabam... state highway director for several month... has returned to his old position of offi... engineer, **Robin Swift**, newly appointe... director, announced recently. **Ree... Harvey**, who has been office engineer ... the interim, will resume his title as chi... of highway planning surveys.

L. D. Robbins, contractor of Boise, Idah... has been appointed to the Idaho Publi... Works Contractors' Licensing Board.

Ed N. Rodgers has been appointed a... sistant highway director for Alabam... He was formerly chief engineer of th... State Highway Department.

W. C. Williams, formerly division engi... neer at Portland, Ore., for the Orego... State Highway Commission, is now a... Camp Claiborne, La., for training an... assignment as a captain in the Corp... of Engineers. His post as division engi... neer has been filled by **Frank T. Youn...** of Oregon City, Ore., previously resi... dent engineer at Portland.

Governor John Bricker, of Ohio has re... appointed **Hal G. Sours**, state highwa... director, as a member of the state boar... of registration for engineers and sur... veyors, for a term ending September 25... 1947.

Maj. L. Ben Prince, chairman of the ... North Carolina Highway and Public ... Works Commission until he entered the ... Army Ordnance Corps recently, is now ... stationed at Fort Leavenworth, Kansas.

W. Prescott Foster, director of the Louisi... ana, State Highway Department, has re... signed to take a post on the state highway ... board. **D. Y. Smith** of Sterlington was ... named Mr. Foster's successor.

FOR WORK WELL DONE

From the burning sands of Africa to the steaming jungles of Guadalcanal, our fighting men on land and sea are in the thick of battle, clearing the way to Victory.

It is our responsibility here at home to keep vital war supplies rolling in ever increasing volume to these men who are doing such a magnificent job on the world's far-flung battle fronts.

War plants, shipyards, air fields, military highways must be built in record time. Cargo ships must be loaded and unloaded without delay. Such a tremendous task requires cranes, shovels and draglines in great numbers.

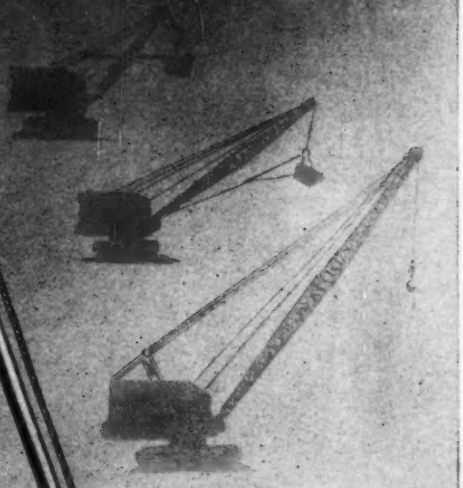
Since the bombing of Pearl Harbor, the men and women of the Shovel and Crane Division of Lima Locomotive Works, Incorporated have been building cranes, shovels and draglines with determination to meet every specification and to exceed every schedule set for them.

As a reward for outstanding accomplishment in the production of war materials, the Army and Navy have conferred upon this Division, the Army-Navy "E" award. Labor and management are proud of the award and the part they are playing in the battle of production.

It will continue to be our pledge to build better cranes, shovels and draglines faster until Victory is won.

ARMY E NAVY

We are mindful of the fact that without the fine cooperation of our many suppliers who have furnished us with parts and materials, our award of the coveted Army-Navy "E" flag would not have been possible.



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Shovel and Crane Division LIMA, OHIO

SHOVELS, ¾ YD. TO 3½ YDS. CRANES 13 TONS TO 65 TONS
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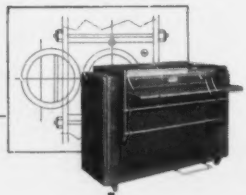

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MEETINGS

AMERICAN CONCRETE INSTITUTE, 39th annual convention, Palmer House, Chicago, Ill. Feb. 17 only.

AMERICAN SOCIETY FOR TESTING MATERIALS, spring meeting, Hotel Statler, Buffalo, N. Y., week of March 1.

REGIONAL AND LOCAL MEETINGS

SOUTHEASTERN ASSOCIATION OF STATE HIGHWAY OFFICIALS, Chattanooga, Tenn., Feb. 16-17.

ASSOCIATION OF HIGHWAY OFFICIALS OF NORTH ATLANTIC STATES, Highway Problems Conference, Hotel Pennsylvania, New York, N. Y., Feb. 17-19, 1943.

IOWA ENGINEERING SOCIETY, 55th annual meeting, Fort Des Moines Hotel, Des Moines, Iowa, Feb. 23-24.

UNIVERSITY OF UTAH, 4TH ANNUAL HIGHWAY CONFERENCE, Salt Lake City, March 1-2.

SOUTHERN SAFETY CONFERENCE, 5th annual meeting, Hotel Peabody, Memphis, Tenn., March 1-2.

HIGHWAY COMMISSIONERS OF THE UPPER PENINSULA OF MICHIGAN, 10th annual meeting, Houghton, Mich., Mar. 11-12.

NEW JERSEY SEWAGE WORKS ASSOCIATION, war conference, Stacy-Trent Hotel, Trenton, N. J., March 25-26.

Elections and Activities

IN AN annual meeting held at Raleigh recently, the North Carolina Society of Surveyors elected P. R. Inscoe of Castalia as president; A. L. McNeil, Rockingham, vice president, and Prof. C. L. Mann, head of the civil engineering department of State College, secretary-treasurer.

J. P. GIBBONS, formerly vice president, has been elected president of the Inter-Mountain Chapter, Associated General Contractors of America, at an annual meeting held recently in Salt Lake City, Utah. Other officers elected include Clarence Waterfall, of Ogden, vice president; J. H. Tempest, secretary-treasurer. J. W. Grant of Springville, and Ellis W. Barker are new directors. Speakers at the meeting included Lieut. Col. Frank V. Ragsdale, San Francisco; Brig. Gen. Warren C. Hannum, head of the Pacific division; Joseph S. Mayer, area director for the war manpower commission; and

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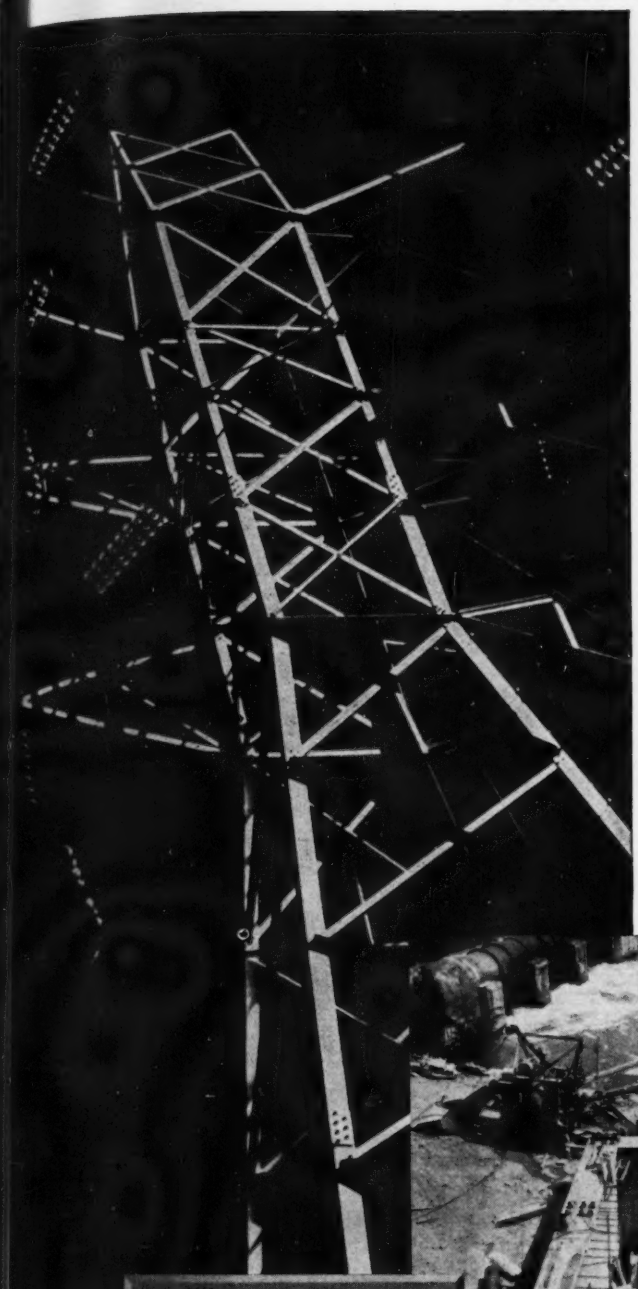

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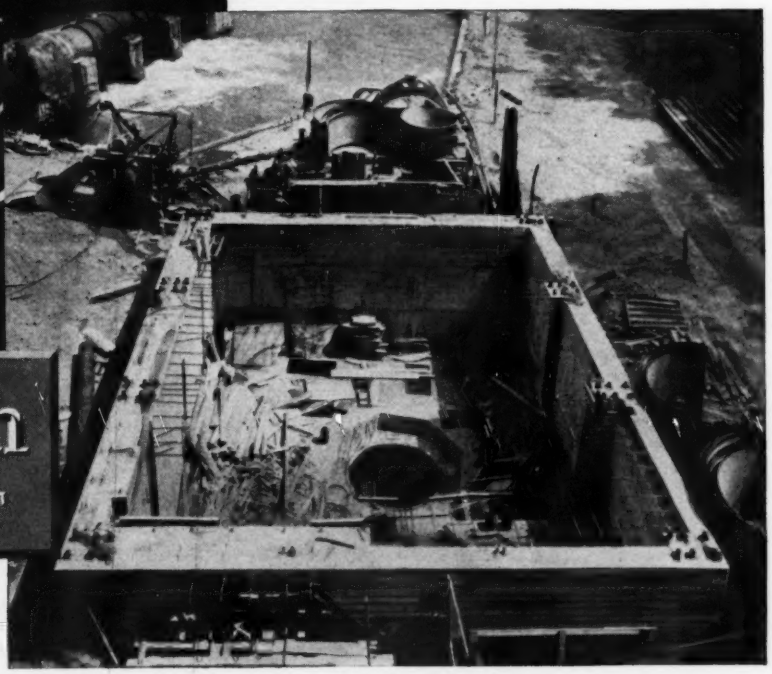

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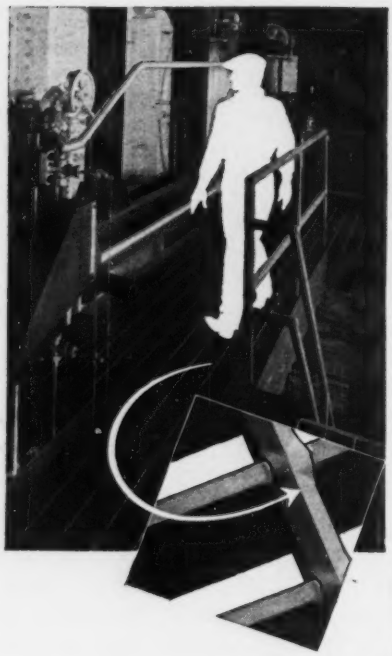

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ROY L. WILLIAMSON, commissioner of public works at Raleigh, N. C., has been elected president of the North Carolina Society of Engineers. Other officers elected include E. D. Burchard, Asheville, vice president; Robert B. Rice, Raleigh, secretary; and W. N. Spruill, Greenville; H. B. Wolf, Concord, and W. M. Corkill, Asheville, directors.

E. M. GREESON has been elected president of the Memphis, Tenn., Engineers Club.

HENRY C. TURNER, JR., vice president of the Turner Construction Co. and head of its Philadelphia office, has been elected president of the Master Carpenters & Builders Co.—the Philadelphia chapter of the Associated General Contractors.

RICHARD ELLIS has been elected president of the Seattle Section, American Society of Civil Engineers. A. L. Miller is the new vice president, while M. S. Campbell has been re-elected secretary-treasurer.

CARL MENGEL, project manager for Olsen and Dietrich, consulting engineers of Raleigh, N. C., has been elected president of the North Carolina Section, American Society of Civil Engineers, at the annual meeting of the section held recently. N. P. Hayes, vice president of the Carolina Steel & Iron Co., of Greensboro, was elected vice president, and George H. Maurice, consulting engineer, was re-elected secretary-treasurer.

C. A. BURDETTE has been elected president of the Associated Engineers of Spokane, Wash. H. C. Whitehouse is first vice president; P. E. Oscarson, second vice president; H. J. Reeves, third vice president, and H. C. Bender, secretary-treasurer. The association includes Spokane sections of the American Society of Civil Engineers, American Society of Metallurgical Engineers, American Institute of Architects, American Institute of Mechanical Engineers, and American Institute of Electrical Engineers.

TOM L. DYER has been elected president of Eta Kappa Nu, national honorary electrical engineering society at the Alabama Polytechnic Institute.

J. F. HARRISON, chief engineer for the Mississippi Power & Light Co., is the new president of the Mississippi Society of Professional Engineers. Other officers elected are: J. B. Fountain, secretary-treasurer, and Bob Morrison, member of the executive committee for the Southern District.

KARL P. KAMMER of New Orleans was

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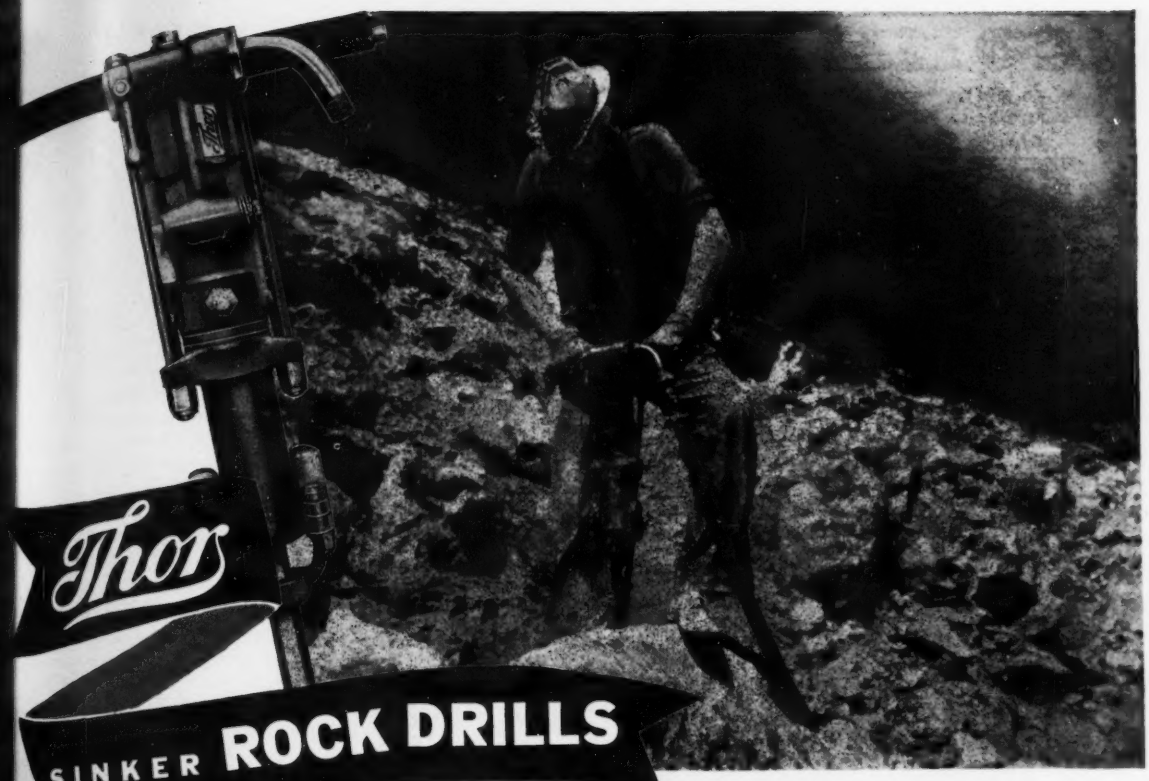

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ON TOUGH, DOWN-HOLE DRILLING

Thor Sinker Rock Drills in every weight class have an *extra* margin of power that means the difference between ordinary and *outstanding* footage on down-hole rock drilling. They hit hard and fast because they actually use most effectively ALL of the air that enters the machines. Basic reason for this is the patented Thor short-travel, tubular valve (with a controlled tolerance of .00025") that measures and admits exactly the right amount of air for peak operating efficiency.

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Thor's precision valve action, *plus* a quick-acting throttle valve, gives drill runners positive control for all operating conditions. This means powerful rotation for hole starting with quick acceleration to top speed for drilling and plenty of air for clean hole blowing. Results — high average drilling speed and *more* holes per shift.

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Just as Thor's principle of "Measured Air" assures full efficiency and control, so also does it provide easy handling. With every stroke powered by the same amount of air, operation is smooth and uniform. Naturally, minimum vibration contributes to longer life, as do the air-cushioned retainer, automatic lubrication and drop-forged steel construction. Today, on scores of road building, shaft-sinking, tunnelling and other projects Thor Rock Drills are delivering more footage per shift.

For All Your Portable Tool Needs — ROCK DRILLS, PAVING BREAKERS, SHEETING DRIVERS, CLAY DIGGERS, BACK FILL TAMPERS, SPIKE DRIVERS, CONCRETE SURFACERS, SAWS, HAMMERS, DRILL STEELS, DETACHABLE BITS, HOSE AND HOSE FITTINGS

A THOR SINKER ROCK DRILL FOR EVERY DRILLING JOB

7 standard models for light, medium or heavy duty work in the most popular weight classes. Other types available for special applications.

MODEL NO.	TYPE OF SERVICE	WEIGHT CLASS
38	Light Duty	45 Lb.
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70 Series	Medium Duty	55 Lb.
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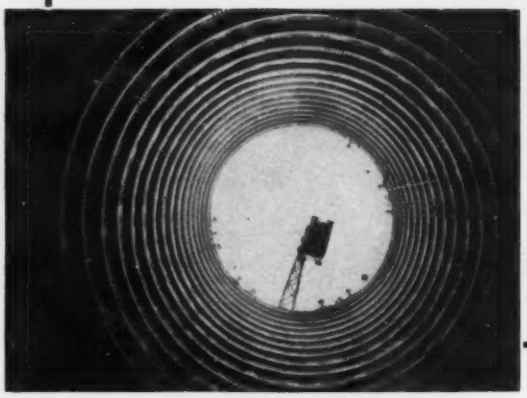

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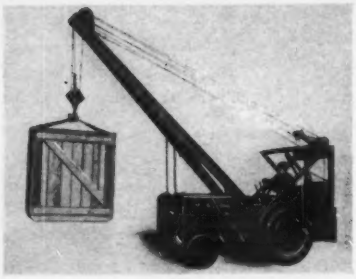

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installed as president of the Louisia Engineering Society at a recent meeti in New Orleans. Other officers, all New Orleans, elected by the organizati included: Charles M. Kerr, first vice pr ident; Reinhard A. Steinmayer, seco vice president, and Clayton L. Nairn, Stone Leake and R. E. Gessa, directors.

AT A RECENT meeting at Harrisbur Pa., Victor J. Snyder was installed president of the Pennsylvania Society Professional Engineers. Other office are: vice president, George A. Rahn; se retary, C. Fred Germeyer; treasurer, E gar A. Weime; and H. Root Palmer an Warren K. Myers, directors. Speake included Richie Lawrie, Jr., state pre dent, and Russell Conrad, state secr tary.

THE 19TH annual meeting of the A sociation of Highway Officials of th North Atlantic States will be held at th Hotel Pennsylvania in New York Ci Feb. 17, 18 and 19. Outline of the pr gram of addresses, papers and discu sions has been practically completed b a committee headed by Fred E. Everet director of the association, and stat highway commissioner of New Hamp shire.

R. A. ELLIOTT, general manager of th Deloror Smelting & Refining Co. Ltd has been elected president of the Ass ciation of Professional Engineers of On tario, Canada, for the current year. M. Aykroyd, outside plant engineer of th Bell Telephone Co., of Toronto, has bee elected vice president. Councillors fo the civil engineering branch of the as sociation are G. H. Bryson, street super intendent, Ottawa; J. Clark Keith, gen eral manager, Windsor Utilities Commi sion, and J. L. Lang of Lang & Ros Sault St. Marie. The annual meeting the association will be held on Feb. 1 at Toronto.

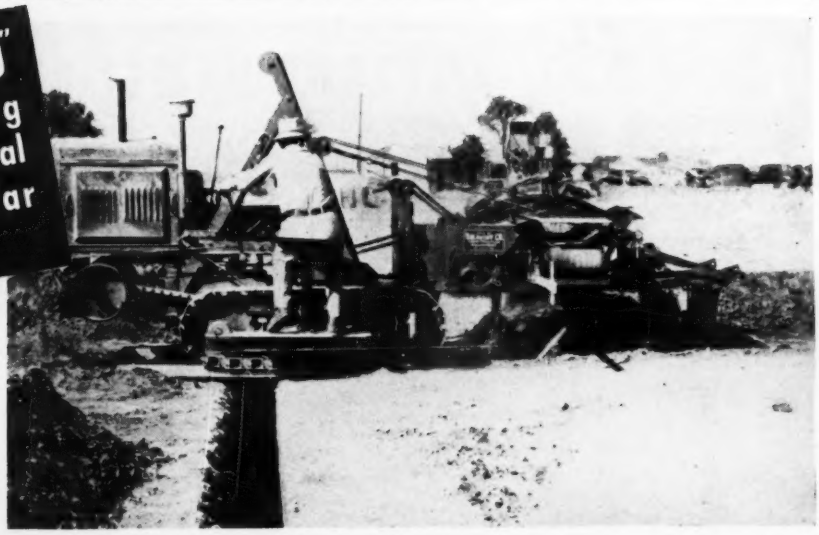
IRVING D. PORTER of Dallas, Tex., ha been elected president of the North Texa Chapter, American Institute of Archi tects. Other officers are Flora A. Klein schmidt, vice president; Everett V Welch, Dallas, secretary; John B. Dana Dallas, treasurer.

TULLIS N. CARTER of Carter, Hall Aldinger, Ltd., general contractors o Toronto, has been elected president o the Ontario General Contractors Asso ciation at a recent meeting in Toronto H. J. Ball, of Ball Brothers, Kitchener was elected first vice president.

MEMBERS of the Columbus section o the Architects Society of Ohio at a re cent annual meeting reelected Ray Sim as president. Other officers renamed were

For More Than 20 YEARS "CLEVELANDS" Have Been Delivering More Trench with Less Work and At Lower Cost On Hundreds of Pipeline Jobs.

Today "CLEVELAND" Is Proud to be Serving Our Military and Naval Services On Many War Emergency Projects.



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In today's pipeline construction programs, Speed, Endurance, Low Cost operation and Service are the most essential machine requirements. That's why "CLEVELANDS" fit so perfectly into the picture and are preferred equipment on so many war emergency projects, current and recent. • Geared to the job "CLEVELANDS" are delivering maximum performance, day in and day out, at rock bottom costs.

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John Quincy Adams, Jr., vice president, Robert Roerrer Rush, secretary.

O. E. SELLERS of the bureau of materials of the Illinois state highway department was elected president of the Springfield chapter of the Illinois Association of Highway Engineers, at a recent meeting at Springfield.

MARSHALL HURD has been elected president of the Sioux City, Iowa, Engineers Club, succeeding Walter Webb. Other new officers are M. M. Wood, vice president; K. C. Ainslie, treasurer, and Leslie Alt, secretary.

C. P. OWENS, of Springfield, Mo., has been elected president of the Missouri Society of Professional Engineers. Other officers recently elected include: O. L. Lamb, Macon; Bruce Williams, Joplin, and C. G. Roush, vice president; H. J. Brueggin, Jefferson City, secretary-treasurer, and L. B. Rush, St. Joseph, O. D. Chrisman, Springfield, William Anderson, Jefferson City, and E. R. Schultz, Cape Girardeau, directors.

HORACE E. LUMMER, chief of the Portland, Ore., municipal building inspection division, has been elected president of the Oregon Building Congress.

LEWIS L. MERRITT, of Wilmington, N. C., has just been elected president of the Wilmington Engineers Club. Other new officers are: George Thomas, vice president; C. A. Williams, secretary and treasurer; H. E. Hicks and Charles Jones, directors.

G. BROOKS EARNEST recently was installed as president of the Cleveland Chapter of the American Society of Civil Engineers, as that group held its first meeting of the new year. Other officers installed were: Mark Swisher, vice president, and Arthur H. Stark, secretary-treasurer.

MAJ. W. H. MILLS, JR., of Charleston, has been elected president of the South Carolina Society of Engineers during the group's annual joint meeting with the South Carolina section of the American Society of Civil Engineers at Columbia recently. Other officers named were Prof. John Anderson, vice president, and A. E. Johnson, secretary-treasurer.

In the meeting of the A.S.C.E. group Prof. L. S. LeTellier of The Citadel, Charleston, was elected president of the section, with L. A. Emerson of Columbia, vice president, and A. E. Johnson, secretary-treasurer.

NOEL MCKEEHAN has been elected president of the Phoenix, Ariz., chapter, American Association of Engineers. Other officers include J. Lee Chambers, secretary-treasurer; Charles S. Beck and

Simple, SYSTEMATIC DRIFTER LUBRICATION CUTS REPAIRS, BOOSTS FOOTAGE

A FEW MINUTES A DAY AND A LITTLE OIL WILL HELP YOU MEET WAR-TIME NEEDS

Regular lubrication is a vital factor in the performance and service given by any drifter drill. It is particularly important today when the war effort and the scarcity of strategic materials demand the conservation of every piece of drilling equipment.

Here are four simple lubrication suggestions which will help you get the most out of your CP Drifters. While these suggestions apply particularly to CP MOTORdrifters they are applicable generally to other models. Detailed recommendations on hand-cranked CP Drifters will appear in future advertisements.

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1 Twice each shift, fill the drifter oil reservoir with a good grade of rock drill oil.

2 Be sure to keep the motor feed oil reservoir filled with good grade of rock drill oil.

3 Check the feed screw frequently. Keep an oil can handy, oil feed screw occasionally.

4 Before operating drifter, turn on air and make sure oil is blowing through exhaust.

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Already America's vast network of reinforced concrete highways, bridges and airports is helping to free men from barriers of distance, time and transportation costs—opening up the fuller life. Massive concrete dams are making low-cost electricity available to more and more millions—lifting old burdens. Concrete water supply and sanitation systems are contributing to greater health. On farms and in cities, beautiful, enduring concrete by its permanence and lasting economy is making American life better.

After victory over the Axis, reinforced concrete "dream" homes, and concrete construction of all kinds, will again serve in bringing freedom from want and from fear.

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Much of America's concrete is reinforced with Wickwire Spencer Steel's Welded Fabric, to help Concrete achieve its *maximum strength with greatest economy*. Famous, long-lived Wickwire Rope, Perforated Metals, and Wire Cloth also serve the industry in mines, quarries, cement mills, and in construction. Wickwire Spencer Steel Company, 500 Fifth Avenue, New York, N. Y.

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Charles C. Pillotson, vice presidents.

INNIS W. WARD, city engineer of Duluth, Minn., has been elected president of the Eighth District Society, Minnesota Association of Professional Engineers. Other officers are: E. R. Boyce, Virginia, vice president; and E. C. Slagle, Duluth, secretary-treasurer.

ARVIN PAGE has been installed as president of the Winston-Salem, N. C., Engineers Club. Other officers installed at the same recent meeting were: R. A. Thomas, vice president, and C. E. Stephenson, secretary and treasurer.

THE Portland, Ore., chapter of the Associated General Contractors, has elected J. R. Winniger of Warren Northwest, Inc., as president.

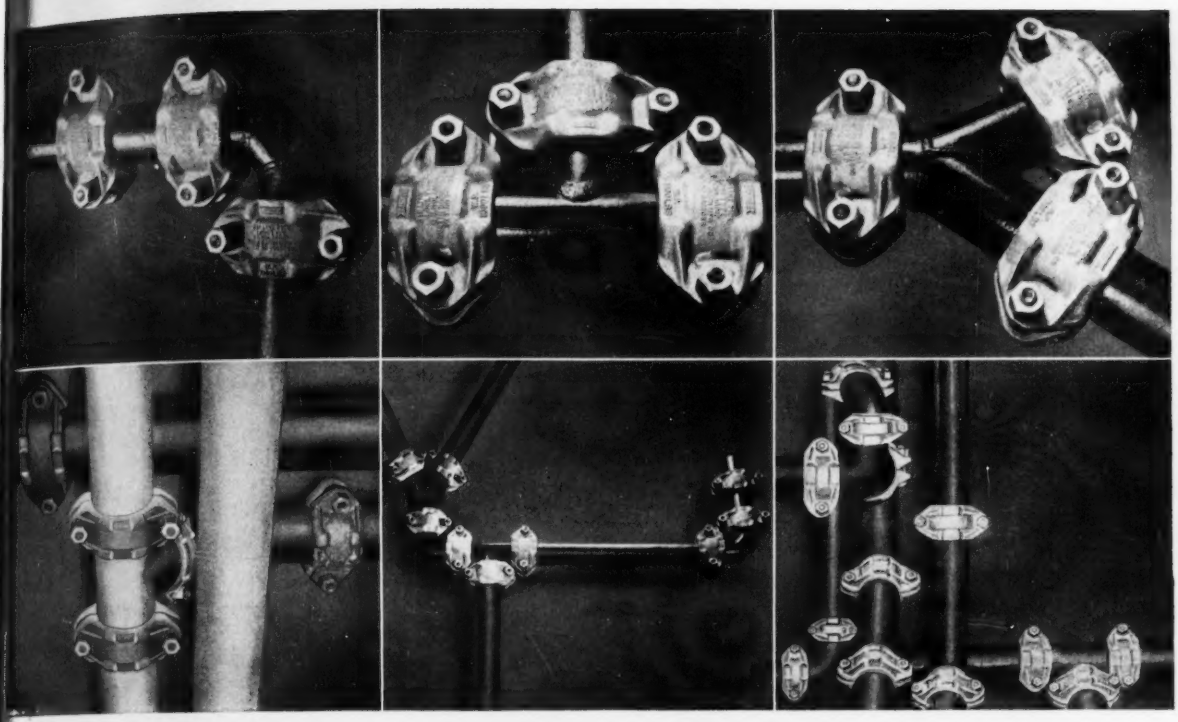
THE WESTERN Asphalt Association, composed of petroleum refiners and paving contractors, held its annual business conference in Los Angeles, Cal., recently. J. R. Keane, re-elected president for the coming year, was the principal speaker at the meeting, devoting his talk to the construction of alternate highways to war plants and military posts. Also elected for the year were: J. R. Pemberton, vice president; R. M. Bludget, vice president; C. W. Powell, treasurer, and H. P. Frackelton, secretary; and S. M. Griffith, C. W. Powell, A. F. Brough, G. R. Daley and Mr. Keane as members of the board of directors.

THE Mountain-Pacific chapter of the Associated General Contractors, with headquarters at Seattle, Wash., has re-elected its 1942 officers to serve for the coming year. Carl Erickson will continue as president, Elmer White as vice president, and L. Paul Fiorito as treasurer.

LLOYD A. CHACEY, engineer in the traffic safety division of the Ohio department of highways, has been elected president of the Franklin County chapter of the Ohio Society of Professional Engineers. He succeeds Merle Paul, who resigned recently to accept a commission as a lieutenant in the Navy's construction battalion. Other officers elected were: B. W. Cornelius, vice president; J. F. Barbee, secretary-treasurer; and Philip Burgess and Gustav Hirsch, directors.

GEORGE H. FERGUSON, chief sanitary engineer for the Canadian department of national health, has been elected chairman of the Ottawa branch of the Engineering Institute of Canada.

WILLIAM H. GEBHART, deputy county engineer in charge of bridges, has been installed as president of the Canton, Ohio, Regional Society of Professional Engineers and Surveyors. Other officers installed for one year terms were: George



G-B Rolagrip Couplings and Segweld Fittings Help Shipbuilders Save Millions of Man-Hours

Long before an emergency existed many shipbuilders switched to G-B Rolagrip Pipe Couplings and G-B Segweld Fittings for sound and sufficient reasons.

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2. To simplify and speed up installation. With a simple wrench G-B Rolagrip Pipe Couplings are applied in far less time than by any other method of joining pipe. There are only three parts to position; only two bolts to tighten.

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4. To get a permanent, leak-tight seal on ship plumbing. fire mains, overflow, fuel oil, scupper, cargo, bilge, ballast and peak tank lines.

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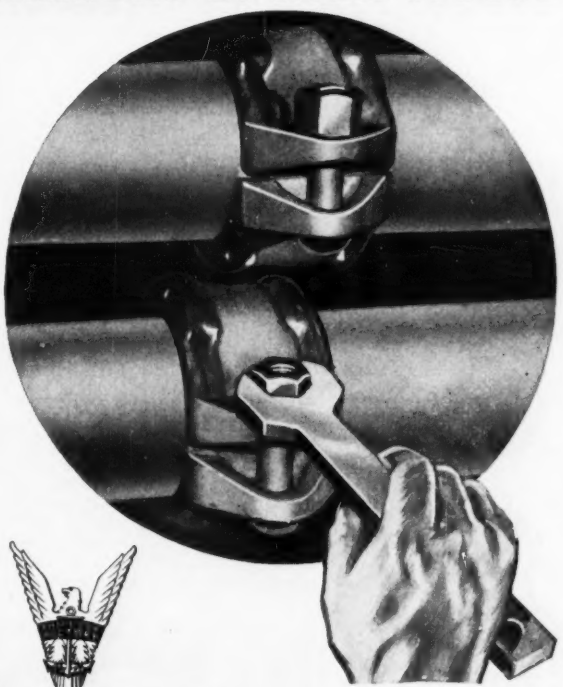
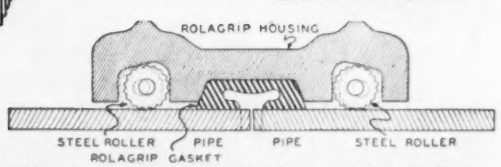
6. To save weight and retain pipe strength. Rolagrips give greater strength with less weight. Applied on plain end pipe they avoid weakening the pipe wall by cutting away.

Shipment of Rolagrip Pipe Couplings as well as plain end G-B Segweld fittings are made in days instead of weeks. In case your pipe stock has grooved ends, we can supply G-B Gruvagrip Pipe Couplings.





The tighter the tension caused by expansion, contraction or deflection, the tighter the rollers grip to hold movement under uniform control.

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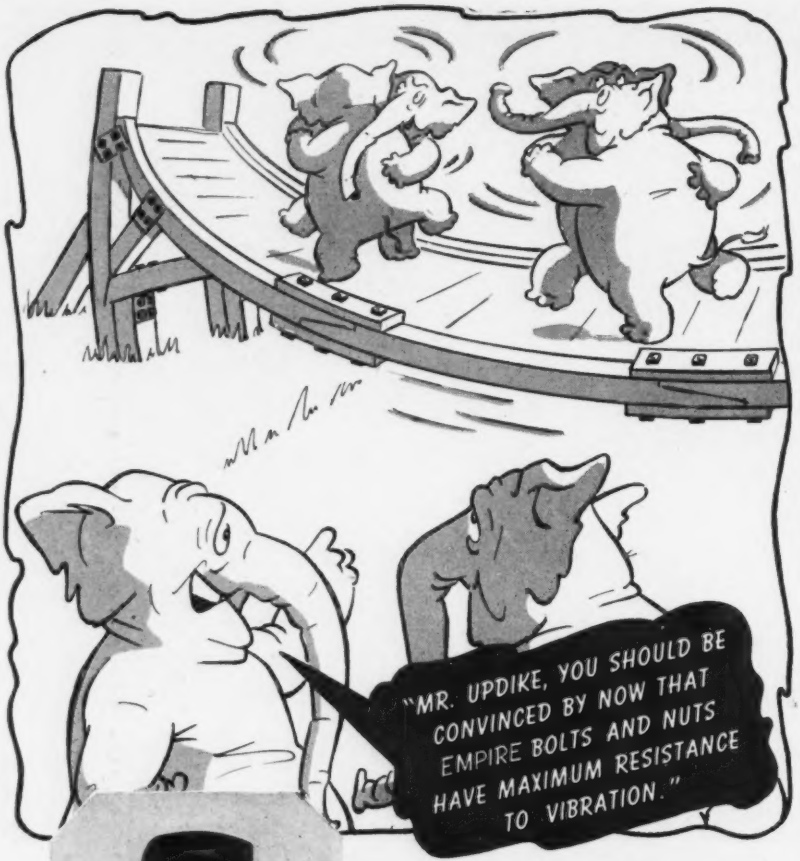
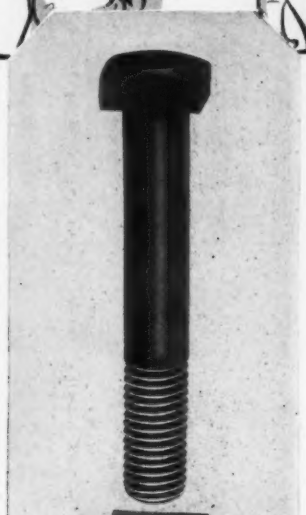
ROLAGRIP
PIPE COUPLINGS
FOR PLAIN END PIPE





EMPIRE COLD-HEADED BOLTS*

STRONGER—Close-grained metal used; grain structure intensified by bolt-making processes and heat treatment.

TOUGHER—Cold-reduction of shank toughens skin surface for threading.

CLEANER—Threads *cold-worked;* strong, accurate, clean for quick assembly.

QUICKER—Point chamfered (60°) for ease in assembly.

*Up to ⅞" x 8"; larger sizes manufactured by another method.

EMPIRE NUTS*

STRONGER—Hole is punched at *right angles* to grain — no splitting.

TOUGHER—Processed to guard against stripped threads.

CLEANER—Tapping is done with frequently-changed taps.

QUICKER—Accurate tapping means nuts run on fast; counter-boring of hole means quick get-away.

*Regular nuts are processed cold through ⅜".

EMPIRE and allied fastening products since 1845

RB&W *Making strong the things that make America strong*

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Factories at Port Chester, N. Y., Rock Falls, Ill., Coraopolis, Pa.

Sales offices at Philadelphia, Chicago, Detroit, Chattanooga, Los Angeles, Portland, Seattle

Wallace of Massillon and William Sahlberg, Navarre, vice presidents; E. W. Brong, secretary-treasurer.

WENDELL R. LADUE, superintendent and chief engineer of the bureau of water and sewage of Akron, Ohio, has been elected president of the Akron district, Society of Professional Engineers.

WESLEY W. POLK, chief highway engineer for Illinois, and C. M. Hathaway, engineer of construction for the Illinois state division of highways, were speakers at a one day session of the Illinois Contractors' Association held recently at Springfield. J. F. Parker of Springfield was re-elected president of the organization, with E. S. Hurwich and C. J. Moritz named treasurer and vice president, respectively.

JOS. W. IVY has been elected president of the Kansas City section of the American Society of Civil Engineers.

THE 10TH annual meeting of highway engineers and commissioners of the Upper Peninsula of Michigan will be held in Houghton March 11-12. W. W. McLaughlin, research and testing engineer of the state highway department, will be general chairman, assisted by H. F. Mandefield of the Michigan College of Mining and Technology; P. H. Thornton of Hancock, and W. C. Veale, Keweenaw county road engineer.

J. E. DUNN of the J. E. Dunn Construction Co. of Kansas City, Mo., was elected president of the Kansas City chapter of the Associated General Contractors at a recent meeting. He succeeds Larry Winn. Other officers elected include L. W. Weeks, vice president, and Carl T. Stanch, treasurer.

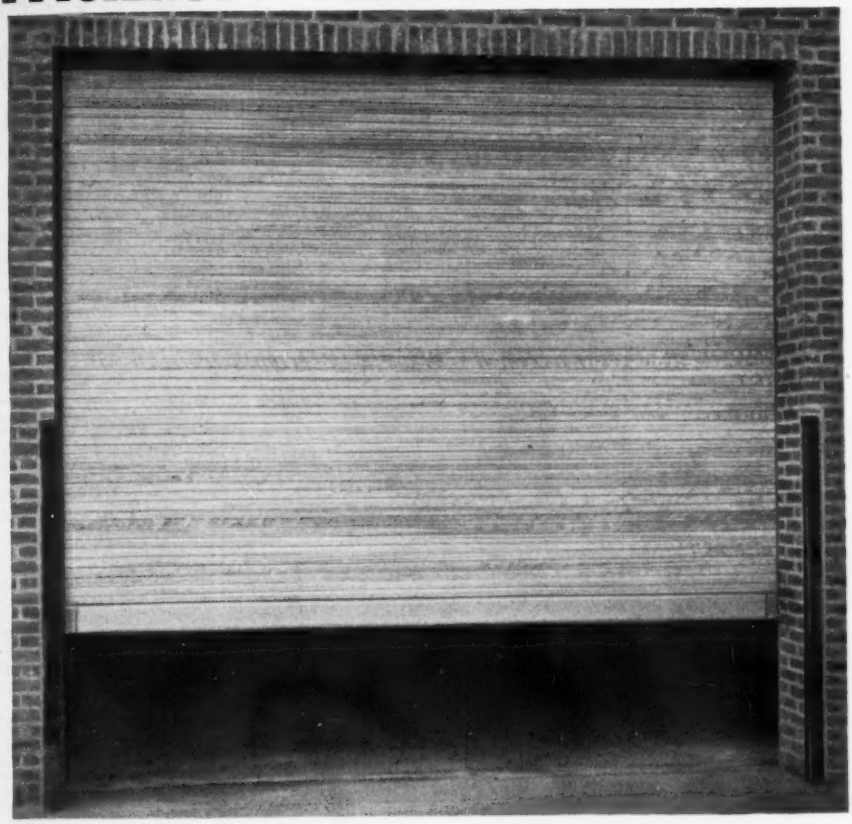
MEMBERS of the Builders Association of Kansas City recently elected Albert R. Waters as president of their organization for the coming year. Other officers include L. W. Weeks, first vice president; Fred C. Baehr, second vice president, and Emil J. Rohrer, treasurer.

A REPLICA of the Julian C. Smith memorial medal was presented recently by the Engineering Institute of Canada to James Wilson, president of the Shawinigan Water & Power Co.

M. G. SPANGLER of the Iowa State College Engineering Experiment Station, and M. B. Russell, of the college's agricultural experiment station, have been awarded the 1942 Highway Research Board certificates of merit for their study of "The Concept of Soil Moisture and the Mechanics of Unsaturated Flow."

ISIDOR SLOTNIK, well known contracto

PROVED . . . and ready for WARTIME EFFICIENCY . . . with SAVINGS in STEEL



KINNEAR *Wood* ROLLING DOORS

Kinnear Wood Rolling Doors are meeting today's demand for time-and-space-saving doors that minimize the use of critical materials. They feature the efficient coiling upward action of the famous interlocking steel slat door which Kinnear *originated* nearly half a century ago!

Constructed of inter-lapped wood slats jointed with metal cables or tapes, these sturdy Wood Rolling Doors travel upward in special jamb guides. They coil out of the way and out of reach of damage, requiring no usable floor, wall, or ceiling space for either storage or operation. The rugged wood-slat curtain blocks out wind and weather, and affords remarkable protection against intruders and saboteurs. Only carefully selected, specially treated woods are used, assuring maximum wear at lowest maintenance costs.

To meet all wartime door needs *without* sacrificing performance and service, install Kinnear Wood Rolling Doors. Available in any size, for exterior or interior installation in old or new buildings. Motor, manual, or mechanical operation.

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Complete data, showing the strength, weather protection and smooth coiling action of the wood slat assembly.

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OFFICES AND AGENTS
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SAVING WAYS IN DOORWAYS

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ROLLING DOORS

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and treasurer of the J. Slotnik Co. of Boston, was elected president of the Associated General Contractors of Massachusetts at an annual meeting at Boston recently. He succeeds Matthew J. Cummings. Other officers elected were Edmund J. Rappoli, vice president; Mr. Murray Weiss, treasurer; and Richard J. White, secretary. Speakers at the annual meeting included John W. Kellar, chief of industrial manufacturing section, regional OPA; Matthew J. Cummings, retiring president, and Mr. Slotnik.

The meeting was called a war construction conference and it was stressed by Mr. Swanson that little time would be given to the accomplishments of the industry but time would be devoted rather to problems that are before the industry for the future.

J. L. THOMPSON, assistant manager of the Kentucky Actuarial Bureau, has been elected president of the Engineers' and Architects' Club of Louisville. W. I. Gregory was elected vice president and G. W. Hubley was re-elected secretary. New directors are A. B. Doudna, J. H. Kurrasch, M. J. Robertson, E. R. Ronald, A. G. Rosenbaum and B. E. Payne.

R. E. BRAGSTAD, city engineer of Sioux Falls, S. D., has been elected president of the South Dakota Society of Engineers and Architects at that group's 24th annual convention. W. H. Gamble of Brookings was elected vice president; N. M. Pierce of Huron was named secretary and treasurer; and Earl D. Drake of Rapid City, E. W. Meeker of Pierre, and W. R. Edginton and W. F. Blatherwick of Sioux Falls were elected members of the executive council.

WILLIAM F. COCHRANE, representative of the district office of the army engineer corps at Omaha, and a former city engineer at Watertown, S. D., served as toastmaster at the annual banquet. The convention was limited to a round table discussion of the wartime effect on the engineering and architectural professions.

THE ASSOCIATED General Contractors of Minnesota held their annual conference at the St. Paul Hotel, St. Paul, Minn., recently. W. M. Cedarstrand of Minneapolis was chosen president to succeed O. W. Swanson of St. Paul. Frank B. Winston of Minneapolis was elected vice president in charge of the heavy construction division; Stuart W. Leck of Minneapolis was made vice president in charge of the building contractors division; John Dieseth of Fergus Falls, vice president in charge of highway construction division, and George Walker of Minneapolis was named secretary-treasurer.

FRONT END SHOVELS
for Case Tractors
Extensible Booms—8' Lift
½ and ⅝ cu.yd. Capacity.

Other Products
CONCRETE VIBRATORS
Gasoline Engine and Electric Motor Driven Models
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Compact! Powerful! Safe!

DISTRIBUTABLE CONTROLLED POWER
with ALL STEEL HAND HOIST
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Money Has Been Saved on These Jobs

1200' assembled pipe (132 Tons) were lowered to bed of Mississippi at St. Paul with 9—5-Ton Beebes, three lines to each hoist through blocks.
Hudson River Bridge sidewalks were laid in sections with 32—5-Ton Beebes.
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GET THE MOST OUT OF EVERY ELECTRODE

Burn them down to a 2" stub

Welding electrodes are scarce and must be conserved. By burning every electrode down to a 2" stub you can save up to 5 lbs. of electrodes from every 50 lb. box.

This is one important way that good welding operators are helping to meet the electrode shortage. Some other important rules to follow are:

1. Choose the proper welding current for the size of electrode being used. Excessive welding current may break down the coating before the electrode is consumed.

2. Select largest diameter electrodes to get faster deposition of metal. Using an 18" length instead of 14" reduces the number of times it is necessary to change an electrode for a given length of weld. This increases welding speed 25-30% and saves 3-4% stub loss.

3. Make legs of fillet welds equal and make face of fillet welds flat. Convexity of fillet weld faces should never exceed 10%.

Follow these suggestions to get the maximum work out of every electrode. In this way you can help prevent waste of the vital materials that are needed for victory production.

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DLE CYLINDERS ARE PRODUCTION SLACKERS: *Keep 'em rolling for victory!*

For more than 30 years, McCracken Concrete Pipe Machines have helped solve sanitation problems and have contributed to industrial progress all over the Western Hemisphere. Today there are 72 McCracken plants in the United States and 27 plants in Latin America—each a "Defense Plant" on the home front, serving in production centers, at airports and in training and fortification areas. And they're doing their bit on the foreign fronts too, in such spots as Iceland, Alaska, and the Caribbean and—(censored). In fact, wherever there's a need for a fast, thorough, durable and inexpensive sewage or drainage job, you'll find a need for McCracken Concrete Pipe Machines.

Write for your free copy of "Inter-American Solidarity" telling the story of McCracken's participation in Latin America's development.

McCRACKEN Machines Make: Soil Pipe—Drain Tile—Culvert Pipe—Conduit. Either plain or reinforced, 4" thru to 36".
1. At the Highest Speed
2. Of the Highest Quality
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4. In Any Location

CONCRETE PIPE MACHINERY COMPANY • SIOUX CITY, IOWA, U. S. A.

TRENDS IN THE NEWS

Institute speds health, food projects

Many health, food and emergency aid projects have been undertaken by a new vehicle of cooperation—the Institute of Inter-American Affairs. Less than a year old, the Institute compares with such important factors in inter-American economic and health activities as the Export-Import Bank of Washington, the U. S. procurement agencies, the Pan American Sanitary Bureau, the Commodity Credit Corp. and other government bureaus and agencies.

Already several hundred projects are under way or planned, mostly in the field of health and sanitation. Many millions of dollars have been contributed by the United States and other American nations to make these projects of immediate value for war needs and of long range benefit in raising living standards.

Hundreds of technicians skilled in tropical medicine, food supply, emergency rehabilitation, sanitation and engineering construction have been assigned by the Institute to work with authorities and technicians in the other Americas. The work ranges from a big health and sanitation program in the Amazon basin for the support of a large rubber growing program there, to roadbuilding in Honduras.

• • •

More than 500,000 names on scientific roster

Detailed information concerning the qualifications of more than 500,000 of the nation's scientists and professional men and women has now been cataloged by the National Roster of Scientific and Specialized Personnel, and over 140,000 names have been certified to agencies engaged in the war effort, according to a recent report by the National Resources Planning Board.

Through the Roster, various war agencies have not only received the names of thousands of individuals for full time positions but have also obtained services of many scientific leaders to serve as consultants for

A BIG RESPONSE Greets TIMBEAM

A SYSTEM OF WOOD STRUCTURAL FRAMING

An Alternate FOR THE MORE CRITICAL STRUCTURAL MATERIALS

FILLS AN URGENT WARTIME NEED

Will continue as a permanent system

Although TIMBEAM has been offered for only a short time, it has met with broad acceptance. It has already been used in the construction of more than fifty industrial buildings, and the interest it is creating foretells its widespread adoption.

TIMBEAM offers a solution to the serious problem occasioned by the placing of many of the conventional structural materials on the critical list. It is an I-shaped wood fabrication, constructed of standard plywood and standard dimension lumber, the materials being readily available.

TIMBEAM reduces the load of the beams and columns up to 50%, with the equivalent strength obtained from steel or solid wood members. This makes for economy in foundation design and fast and easy erection.

TIMBEAM is fire safe . . . affords minimum shrinkage and offers lasting qualities. It is a practical structural system, WPB approved. WRITE FOR CATALOG.

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WOOD PLATE GIRDERS . . .
BEAMS . . . PURLINS . . .
JOISTS
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REG. U. S. PAT. OFF.

Easy-to-read, *raised* black graduations on crack-proof white surface . . . resist abrasion from rock, sand, scraping over rails, pipe, concrete, etc. In all sizes and types—in cases or reels. Ask your dealer—or write for catalog.

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Now... DOUGLAS FIR PLYWOOD BUSSES!

The exteriors, interiors, partitions and floors of Santa Fe Trailways' smart new 117-passenger Victory Liners are built of this Miracle Wood!

This is just one of Douglas Fir Plywood's many wartime jobs. Write for our new War Use Folder today. It will show you dozens of actual photographs of startling plywood applications . . . will prove to you why—after Victory—Douglas Fir Plywood will serve you better and in more ways than ever before. Douglas Fir Plywood Association, Tacoma, Washington.

STRONGER PER POUND THAN STEEL!

DOUGLAS FIR
PLYWOOD
Real Lumber
MADE LARGER, LIGHTER
SPLIT-PROOF
STRONGER

short periods of time.

In cooperation with the Selecti Service System, the Roster is co tinuing the task of completing t registration of all men from 18 65 years of age who have scienti or profesional training or expe ence. Many of the nation's mo eminent scientists have collaborat in devising classification methods th can produce from a central regist any desired combination of scienti skills within a few hours' time.

The central organization of t Roster was established jointly by t U. S. Civil Service Commission a the National Resources Planni Board in June, 1940, as a preci index of the country's scientists a other specially qualified citizens. T job of developing and administeri the Roster was placed in the han of Dr. Leonard Carmichael, pre dent of Tufts College, who was nam director; and of James C. O'Brie Civil Service Commission executi who was appointed executive offic

• • •

Collection Ordinances Amended To Salvage Tin Cans

Berkeley and Fresno, Cal., ha amended their garbage collection or inances to make tin can salvage easi according to the American Publ Works Association.

Tin cans cannot be put in regul garbage containers, but must placed in separate ones under Berk ley's amended ordinance. The ca must be prepared—cleaned, labe and ends removed and sides flatten —and the container placed on t front curb no later than 6 a.m. collection day.

In Fresno, prepared tin cans no must be placed in separate containe which, in turn, must be placed in t alley behind residences—or in fro of homes if there is no alley—n more than 24 hours before collecti day, and removed within 12 hou after collection. Collections are ma once a month, on pre-designated day in both cities.

Berkeley has been salvaging mo than 50 tons of tin cans a month, ci officials report, with collection co practically met by money receiv from sale of the cans. Salvaged ca are taken directly to the city incl erator and loaded by conveyor in

ight cars for shipment to detinning
nts. Fresno expects to finance most
ll collection costs through sale of
s.

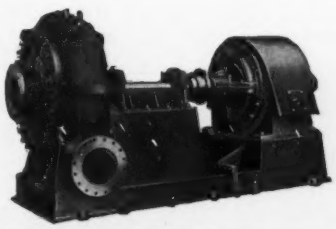
. . .

Asphalt roofing production is high

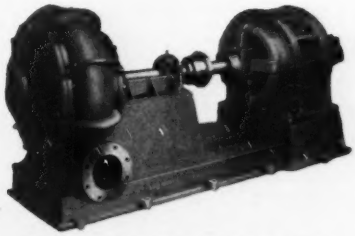
Production of asphalt roofing, the
st widely used roofing material in
s country by far, reached the high-
mark in history during the nine
nth period, January through Sep-
nber, 1942, according to J. S. Bry-
, managing director of the As-
lt Roofing Industry Bureau.
In the first three quarters of this
r, Bureau of Census figures show
t 38,006,928 squares of asphalt
ofing were shipped. (A square is
amount of roofing required to
er 100 square feet of roof area.)
is was an increase of 23.4 percent
r the same period last year when
,788,604 squares were shipped.
ipments for September were 5,439,-
7 squares, an increase of 5.6 per-
nt when compared with August
42, and an increase of 30 percent
en compared with September 1941.
"The bulk of this considerable in-
ease," according to Mr. Bryant,
as due to the use of asphalt roof-
g on military structures and war
nts. Because of its high fire-resist-
ce, availability and use largely of
n-critical materials, asphalt shin-
s, asphalt roll roofing or asphalt
ilt-up roofing have been used on
st army barracks, warehouses,
ds and administrative buildings.
ousands of newly built war fac-
ies have also been protected against
e and the weather with asphalt
ofs.
"In the residential field, mineral
rfaced asphalt shingles are the chief
ofing material used on defense
uses of all types, including the new
mountable houses recently erected
the eastern seaboard," Mr. Bryant
tes. "Asphalt shingles and mineral
rfaced roll roofing both lend them-
ves to pitched roofing because of
ir fire-resistance, their ease of ap-
ication, and their variety of built-in
lors.
"Unfortunately, the weather makes
concessions for war. For, in addi-
n to this intensive war construc-
n, the asphalt roofing industry has
o had to maintain many of the
ofs on the country's 30,000,000

IF YOUR PRODUCTION NEEDS A PROD

Sand and Gravel producers continually tell us how Morris Hydraulic Dredges have speeded up their production. In some instances, far more than the expected capacity has been obtained . . . in other cases, compacted material which could not otherwise be dredged has been successfully handled . . . in still other cases, surprising records of low operating and maintenance costs have been made . . . by Morris Dredges and Dredging Pumps. Let us give you actual facts and figures . . . full information on request.



Morris Heavy-Duty Lined Dredging Pump



Morris Medium Duty Dredging Pump

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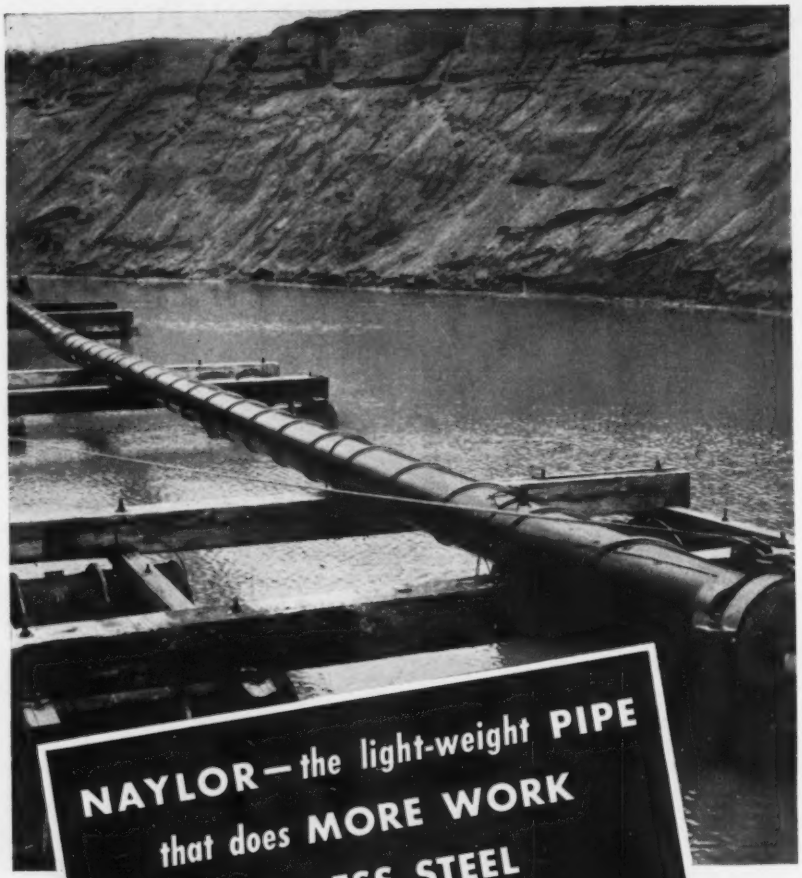
CENTRIFUGAL PUMPS



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SAVES STEEL
SAVES WEIGHT
SPEEDS INSTALLATION
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CONNECTIONS TO FIT YOUR NEEDS
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More and more contractors are specifying Naylor Pipe because it out-performs all other light-weight pipe on high as well as low pressure lines. The exclusive Naylor Lockseam Spiralweld structure provides a leaktight pipe that is stronger and safer—built to absorb shock loads, stresses and strains. Its light weight makes it easy to handle. Its concentric ends simplify connections. You save money all along the line.

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Dredging . . Hydraulic Sluicing . . Dewatering . . Ventilating . . Exhaust and Intake . . Gas Gathering . . Pulp Lines . . Vacuum Lines . . and other high or low pressure lines

Sizes from 4" to 30" in diameter with all types of fittings, connections and fabrication. Write for Catalog.

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Naylor

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civilian structures. A leaking roof [illegible] often leads to more serious impai[rment] of health and property. In order to protect our houses, offices and factories against invasion by the elements, it is imperative that the roofs be maintained."

• • •

City-County Health Wor Combined in Louisville

Louisville and Jefferson Count Ky., have completed nine month operation of a consolidated cit county health agency which, by r ducing or reallocating professiona workers, unifying bookkeeping an making other administrative adjus ments, has greatly improved heal and hospital facilities of the com munity.

As an additional result of the co solidation, according to the Intern tional City Managers' Association, modern health center is under co struction with assistance of the Fe eral Works Agency to house the pr ventive and venereal disease clinic laboratories, and other offices of t integrated health services.

The new city-county health agen consists of a board of five citize appointed jointly by the county judg and the mayor, who are ex offic members. The board, serving fou year staggered terms, appoints a d rector of health, who is the chief a ministrative officer. The unit is nanced jointly by the city and count under a law enacted by the Kentuc legislature early this year.

Besides placing all positions requ ing special skill and training und the merit system, the consolidati has resulted in improved use of pe sonnel, the Association said. The is one superintendent for the gener and tuberculosis hospitals, and if particular practice proves successf in one hospital it is put into effect the other.

The 73 public health nurses w before the consolidation worked se arately for the county and city n work on all phases of public hea throughout the county.

The consolidation has made p sible an intensification of the tub culosis case-finding work. Where fluorographic unit was in use in J ferson County in 1941, four un soon will be in operation. One w be installed at the general hospi

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from receipt to shipment!

That's all the time it takes, on most orders, of most sizes, for this modern galvanizing plant to turn out galvanizing fully able to meet your most exacting specifications...

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This new improved Union Dowel and Joint Assembly Unit assures lower cost, simplified installation, and fool-proof, trouble-free functioning. Dowels are accurately positioned and locked parallel to each other and to the subgrade.

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UNION STEEL PRODUCTS CO.

417 Pine St. Albion, Mich.

where every one of the 20,000 patients passing through the institution and its clinics each year will be examined for tuberculosis; and two portable units will be used throughout the county.

Southeastern FWA office has many projects

The regional office of the Federal Works Agency at Richmond, Va., started the new year with 85 projects, comprising a $35,000,000 program of war-connected public works, under contract and in various stages of construction, Kenneth Markwell, regional director, said recently.

Virginia, with 38 projects under contract at an estimated cost of $22,819,000, led other states in the region in volume of construction and monetary value of projects. North Carolina was second with 20 projects under contract, calling for expenditures of about $5,148,600, and Maryland third with 15 projects that will be completed at an estimated cost of $3,253,670. Eight projects, costing $3,633,920 were under construction in the District of Columbia, three in West Virginia costing $289,850 and one in Delaware that will be completed at a cost of $91,981.

Projects on which work is under way include recreation centers for service men, hospitals, nurses' homes, public health centers, waterworks and sewerage additions, schools and other community facilities.

Wage increase trend shown in city sanitation bureaus

Wages of municipal refuse collectors and street cleaners have increased in the nation's larger cities during the last year, according to a survey by the American Public Works Association, of pay rates for 15 selected cities.

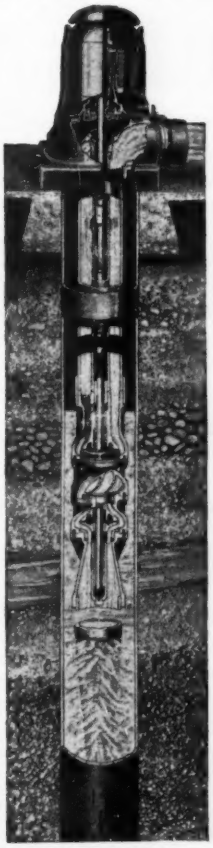
Fourteen of the 15 cities reported pay increases this year, or assured by Jan. 1, 1943, for truck drivers and laborers engaged in refuse collection and street cleaning activities. Average increase, according to the survey, is between 5 and 10 percent.

Work weeks of refuse collectors and street cleaners of the 15 cities range from 40 hours in Detroit, Minneapolis and Cicero, Ill., to 51 hours in Richmond, Va.

Keep 'em flowing

KEEP SHUTDOWNS TO A MINIMUM BY ANTICIPATING YOUR NEEDS FOR PARTS

The whole Peerless organization is back of this program: Care for Your Pump for Your Country! Join this popular movement of pump conservation and keep pump shutdowns to a minimum by anticipating your needs for parts. Repair parts, maintenance hints and other assistance to help you in this program, are available from both Peerless Dealers and Peerless factories. Today's production requirements may have imposed extraordinary service demands on your pump. Remember, your Peerless Pump is a precision product, built ruggedly for years of hard use,—give it the attention it deserves. Your cooperation, plus proper maintenance, plus Peerless service, will protect the performance of your pump. *Let's keep 'em flowing!*



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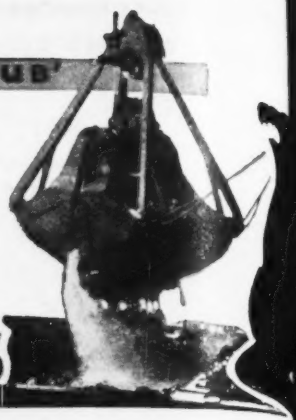

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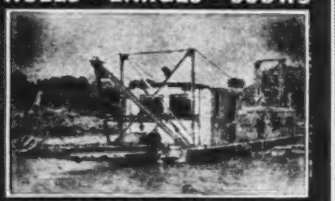

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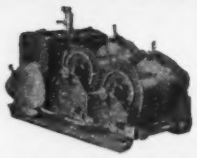

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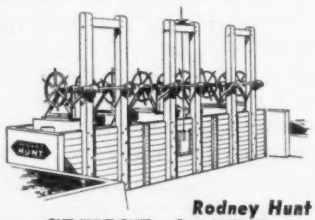

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Comfortable housing still a possibility

Construction of a sound, comfortable family dwelling is still possible under the restrictions imposed by the new war housing standards announced recently by the War Production Board, John B. Blandford, Jr., Administrator of the National Housing Agency, declared recently.

"The National Housing Agency collaborated with the War Production Board in preparing these new limitations, which are applicable alike to private and Government-financed housing for war workers and their families," said Mr. Blandford. "Our purpose in fixing such standards was to provide a basis for private enterprise to continue to produce a large part of the essential war housing. These standards reflect our efforts to produce housing where and when needed with progressively smaller amounts of critical materials.

"The regulations as to design and material consumption are comparable to public war housing standards already adopted by the NHA and to the trend in private housing. They supersend all previous orders covering the same subjects."

The new construction standards will effect important savings in both wood and metal, the NHA Administrator pointed out. Site selection will be limited in order to reduce materials needed for connections with electric, water and gas utilities. The size of the average family dwelling unit now being built by private industry will be reduced to conserve materials required for heating plants as well as those used in the actual construction.

"The trend in private war housing will be away from the single-family, detached dwelling, a policy already in force for public war housing," Mr. Blandford said. "But by careful selection of sites and design and by use of substitutes now generally available, private housing can be built within the new standards to meet the Federal Housing Administration's requirements for mortgage insurance.

"The 75,000 private units now under construction will not be affected by the new regulations. The design of another 75,000 units, for which preference rating orders have been issued but on which construction has not started, need not be changed if the builders do not ask for extension

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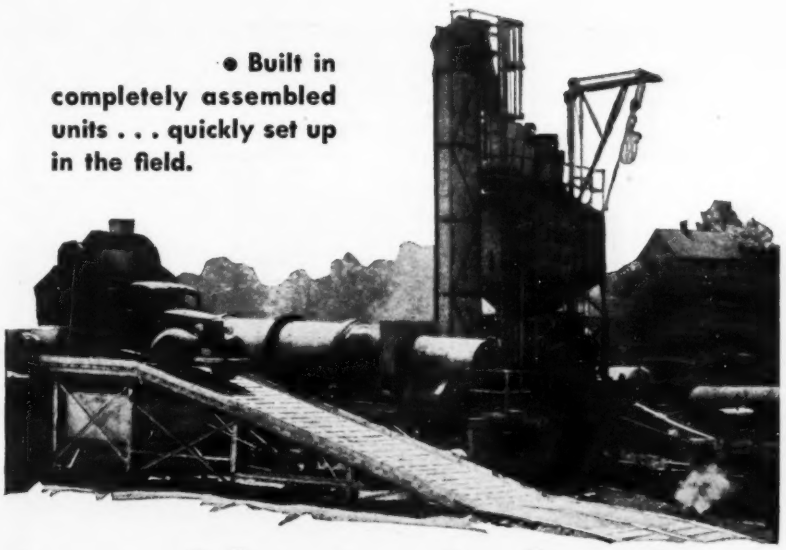

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HANDBOOK OF BRICK MASONRY CONSTRUCTION

By John A. Mulligan

Mason Contractor and Builder

526 pages, 6x9

163 illustrations

219 tables

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- 526 pages of this book give the sort of material you yourself would choose in assembling the most useful everyday handbook for contractors, estimators, masons, architects, and construction engineers.
- Details of every type of bond, how to make joints, handling work under various conditions, general rules every foreman should know, preparation of mortar—are just a few of the practical topics covered.
- You are given knowledge of materials that makes for greater protection, closer figuring, better satisfaction in all aspects of planning, estimating, etc. How masonry materials are made, their characteristics, how they perform, how to test them, etc., is made clear with examples and data.
- Concrete construction, use of all types of brick—common, face, hollow tile, and others—stone masonry, architectural terra cotta, etc., are fully covered.
- An important feature is the emphasis given to ESTIMATING—with pointers, formulas, and methods, and scores of tables to help you in quickly determining material, labor, time requirements, and costs on all types of work.
- Hints on specification writing, how to clean brickwork, fireplace construction, estimating the strength of masonry under varying conditions—in these and numerous other topics the book is dotted with experience-grounded data and pointers such as only a man of Mr. Mulligan's long practice and specialization could supply.

The author, regarded as one of the foremost experts on brick masonry construction, consulted by hundreds of construction people and in many court cases, has drawn on his own 30 years' successful contracting and construction experience for the guiding principles, tested methods, dependable job data included here in handy, quick-reference form.

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of time on their orders. Where extensions are requested, the builders must then conform to the new standards unless their preference rating orders already have been applied to purchase of materials.

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The new standards will reduce by about one-third the quantity of lumber that has been used in the average private dwelling unit, according to NHA officials. Exterior wall construction must be laid-up masonry or other lumber substitute, except in areas where masonry materials or labor are not available. However, any other type of construction permitted by the War Housing Critical List may be used, provided the total softwood lumber needed to framing, sheathing and siding does not exceed certain maximum allowances in board feet per square foot of floor aera.

• • •

Ducts of non-metallic sheets

How sheet board ducts and casing are being used in air conditioning installations to save huge quantities of critical metal, was described recently by T. M. Cunningham, Construction Manager of Carrier Corporation, Syracuse, New York. While the new sheet board does not entirely replace sheet steel, so great is its application that a recent duct system installation estimated at 300,000 lb. required only 66,000 lb. of sheet metal. Sheet boards were substituted for the remaining 234,000 lb.

Several factors must be considered in selecting a sheet metal substitute: availability, ease of fabrication, strength and durability of finished duct or casing, rigidity of material, and surface resistance to air flow. In addition, the substitutes for sheet metal must have a hard, smooth finish, be non-hygroscopic, non-warping and non-inflammable. Preferably the material should be workable with tools usually used for sheet metal work.

Listing Asbestos Ductboard, Asbestocite, ARA Board, Transite, Mason

and Hard Board as among the known substitutes that meet these quirements, Mr. Cunningham said: hese boards, and numerous others ilable, have several advantages r sheet metal used in ducts. They more rigid, so do not require the ross-breaking" that is used in metal cts. They have higher insulating ue so the B.t.u. loss or gain is less n in sheet metal ducts."

From experience in using the metal bstitutes it is believed that $\frac{3}{16}$-in. ck sheet board may be used roughout for some air conditioning stems, especially those ranging in e from 10,000 to 50,000 cfm. By ing only one thickness for an entire ct system, fabrication costs are re- ced and tooling problems are sim- fied, resulting in lower installation sts. In systems larger than 50,000 n, it is advisable to use $\frac{1}{4}$-in. board eliminate stiffening and other con- ruction extras.

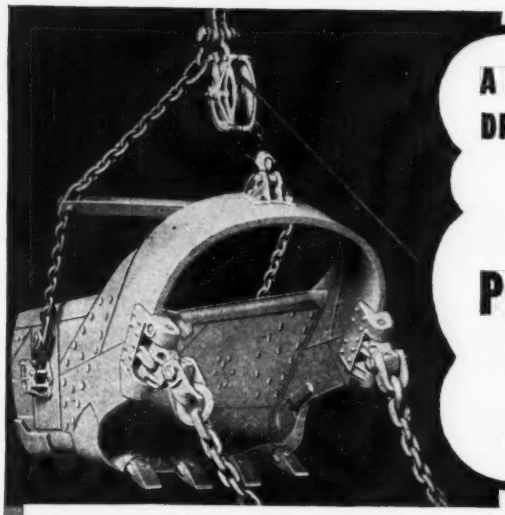
Three more states protect road funds

Citizens of three additional states, wa, Oregon and West Virginia ted overwhelmingly in the general ections of Nov. 3, to amend their te constitutions to require that all ecial highway taxes be spent for ghway purposes. According to the tional Highway Users Conference, is increases to 14 the number of tes having constitutional require- ents that all special highway taxes dedicated to highway purposes.

Proponents of the three "good ads" amendments in the November ections declared that because of re- ced highway revenues resulting m war-time restrictions on motor hicle use it is more important than r to protect highway funds against version to non-highway purposes to sure:

1. Maintenance of existing roads save tires and equipment.
2. Building and modernizing high- ys for strategic military purposes.
3. Modernization and improve- ent of highways after the war.

Kansas and Missouri in 1928 were first states to safeguard highway nds by amendments to their con- tutions. Prior to this month's elec- ns, similar action also had been ken in California, Colorado, Idaho, ichigan, Minnesota, Nevada, New mpshire, North Dakota and South kota.



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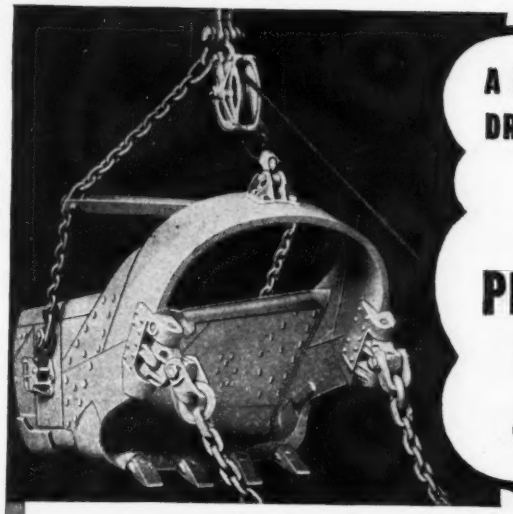

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